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ABSTRACT

The transition to work simulator (TWS) was developed as a policy tool for education and manpower planning. It was designed in anticipation of the Education Amendments of 1976 and the Youth Employment and Demonstration Projects Act of 1977 to facilitate comprehensive planning. TWS is a computerized simulation model of the stream of important decisions persons make in growing from high school students to mature workers. Average simulation is for 3,500 persons. TWS creates a single cohort of persons age fifteen to about thirty-three. It synthesizes information describing individual differences, education/manpower programs, and career experiences. TWS decisions are separated into three categories: (1) creation: circumstantial aspects beyond individual control which determine a person's central characteristics (e.g., sex, race, general ability); (2) high school: decisions about the high school program selected, participation in a Comprehensive Employment and Training Act (CETA) program, etc.; and (3) post high school: major labor market and career related decisions (including decisions about marital status and parenting). Example policy experiments have been conducted using educational policy, manpower policy, a comparison of an educational policy and the Classroom Skill Training and Cooperative Work Experience Program, and high school dropouts. A major TWS advantage seems to be its ability to make understandable the development of persons into workers. (CSS)

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An Introduction To

THE TRANSITION TO WORK SIMULATOR

By

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analyze complex situations and recommend rational alternatives. Not many men I have met can match his record "under fire".

- John Creager, Michael Garet and Maurice Shirley

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- Full documentation for the Transition to Work Simulator is available from the Bureau of Occupational and Adult Education, including the computer program which drives TWS(1).

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AN INTRODUCTION

Government policies which determine the way in which jobs and income are distributed among citizens should be important to both the governing officials and the governed people. In the United States, education and manpower programs are the principal tools of government to sort persons into occupations.

Because of the range of education and manpower programs in operation, the differential effects of these programs on unique individuals and the changing demand for labor in an unplanned economy, it is difficult to predict the impact of education and manpower programs. That education and manpower programs are managed by decentralized agencies of government, i.e., school boards, trustees or prime sponsors, further complicates the development of a systematic description of the expected or real impact of these programs.

The Transition to Work Simulator (TWS) was developed to help the education and manpower policy making community estimate the human consequences of their policies. TWS is a computerized, simulation model of the stream of important decisions persons make in growing from high school students to mature workers. Each prior career decision can become a predictor of a current or future career decision. To simulate a national sample from studenthood to adulthood requires over a quarter of a million calculations. A simulation run takes seconds on a computer. It could take years with a hand calculator. TWS would not have been possible ten years ago.

It is not inappropriate to think of TWS as a computer application designed to help man better understand the future human consequences of various education and manpower policies before such policies are implemented. TWS should not be thought of as sufficient technology for redesigning society

through education and manpower programs. It clearly is not. It should be an additional tool to those already in use. In fact, TWS was designed to be used with current practices for education and manpower planning, including econometric models which attempt to forecast future growth in the market and convert these forecasts into estimates of occupational vacancies. Not to use something like TWS for education and manpower planning is almost to guarantee a blind flight into the future, particularly as these plans influence the lives of people.

TWS attempts to synthesize the observations of the three disciplines which influence education and manpower planning, namely, economics, sociology and social psychology. To the economist, TWS would be conceived as a supply model, and correctly so. It should go without saying that economists are interested in projections of both labor supply and occupational vacancies or demand. Schultz's (1960) pioneering work is generally credited with initiating the current belief that investments in education and manpower programs are investments in human capital or labor supply. Edward F. Denisen (1971) estimates that for the period 1929-1957 increases in education per worker accounted for 23% of national income growth.

Economists take a benefit-cost view of education. So-called benefit-cost or rate of return calculations suggest optimal levels for investments in education and manpower programs, compared to investments in non-human stock. In fact, there are mathematical models to help determine the best human capital/non-human capital investment patterns to optimize growth, under a set of explicit assumptions. To say the very least, economists tend to deal with people in a highly aggregated way in offering advice for education and manpower planning. Their enormous influence on the United States Congress will be described in a few paragraphs.

Sociologists ask different questions about education and work. They are interested in how social institutions like education and manpower programs contribute to the stratification of society. Sociologists tend to be concerned with inter-generational social mobility, that is, the degree to which one can predict occupational status and income of sons and daughters by those of fathers and mothers. Sociologists first attempt to discover the degree to which a society is stratified from one generation to the next, and then try to estimate those events or experiences that contribute to stratification. Intelligence, national origin, motivation, aspirations, peer influence, education and/or manpower programs are among those experiences examined to explain stratification.

As an example of sociologists' work, Lipset and Bendix (1960) argue that opportunities for upward mobility are more a function of occupations generated by an industrial-technical society, than type of government. Blau and Duncan (1967) suggest that the "crass materialism" of the United States citizens causes demand, which creates opportunities and shifts the emphasis of status from inheritance to possessions. In a complex analysis, Duncan, Fetherman and Duncan (1972) determine that the major influence of intelligence on occupational status is through educational attainment.

The notion of education providing credentials for entry into occupational clusters is a result of sociological observations. Sociologists would argue that if education does "credentialize" persons for occupational clusters and if educational opportunities are unevenly distributed among the population and can be predicted from family educational, occupational and income status, then education in the United States is more than an unbiased producer of human capital. Decisions about how educational opportunities are allocated are crucial. Economists infrequently think such thoughts.

Educational researchers, essentially applied social psychologists, are rarely concerned with the societal impact of education. They assume that doing well in school predicts doing well *after school*. *Most educa*tional research criteria are direct program effects, like reading scores, mathematical achievement and knowledge of science and social studies. The usual research strategy is to try to determine which combination of teaching method and teaching person is most effective in achieving a "learning objective" for a group of students. The goal, apparently, is to discover and describe "combinations that make a difference" and prescribe them to individual students like physicians prescribe medicine to individual patients.

Sadly, most of the substantial educational research studies have found few systematic achievement differences that can be attributed to innovative school programs. The classic study was conducted by James S. Coleman (1966). He found no differences among schools in terms of what children were learning that could be accounted for by variations in school resources. Jencks (1972), a sociologist at heart, reported that schools have failed to equalize achievement levels of students, educational attainment or income. He concludes that schools are a clumsy tool for achieving goals of social equality. American Institutes for Research were not able to find achievement differences due to individualized instruction (1976) and Rivilin and Timpane (1975) report that a variety of innovative programs at the elementary level make little difference in learning. My growing judgment is that educational researchers find no differences at the secondary and elementary level because the human mind is adaptable. It can learn the 3 R bill of fare, which characterizes the outcome measures of such experiments, equally well in a variety of ways, taking into account the ability of the learner.

TWS has been developed to include individual differences, school program alternatives, and various educational achievement and attainment levels. Further, TWS includes all the major manpower program alternatives, as well as the important career experiences of simulating persons. This is another way of saying that TWS was developed to synthesize into one flexible model, information which describes individual differences, education and manpower programs and career experiences. TWS provides a process to organize disparate data sets into a comprehensive and coordinated planning environment which ought to be useful to both the policy maker and the scholar in planning and monitoring education and manpower programs.

Before describing how TWS works and displaying results of several example policy runs, it seems appropriate to conclude this introductory section with an observation about the governing view in the United States toward education and manpower programs. It is fairly safe to assert that the Congress is influenced more by economic concerns than issues raised by sociologists or social psychologists. Clearly, they direct legislation at specific target groups in the hope of training persons out of the labor market for occupational vacancies. The Educatioral Amendments of 1976, the CETA legislation of 1973 and the Youth Employment and Demonstration Projects Act of 1977 are clear examples of this. Without question, the Congress appears to have followed the advice of economists, e.g., Freeman (1971), that the purpose of policy is to <u>fit human supply</u> to occupational <u>demand</u> generated by an unplanned economy. In human terms, this could be a costly assumption. It might be that advanced, technological societies simply do not produce sufficient occupational vacancies in which large numbers of the population can successfully function. Technology could be the barrier between millions of people and meaningful work. The reality of an uncontrolled,

advanced technological society could be that it simply makes the work ethic a cruel hoax for millions of people. The Congress seems to respond sporadically to this apparent reality with public service employment, e.g., CETA and the Youth Employment and Demonstration Projects Act of 1977. Sadly, there seems to be no pervasive occupational vacancy policy, with a set of decision rules or options under various employment and unemployment vacancy conditions. The complex structure of people→education and/or manpower programs→jobs is not reflected in policy.

Somehow, Congress has been convinced that occupational vacancies can be predicted in the long term future and are equally useful for both education and manpower planning. Given this assumption, the Education Amendments of 1976 make perfect sense. Create a National Occupational Information Coordinating Committee (with state counterparts) to predict demand by occupation and industry, and train the projected supply to meet the expected demand. If, as Mark Blaug (1973) observes, "It does not appear that manpower patterns can be predicted ten years hence with the degree of accuracy required for educational planners and to pretend otherwise can only do a disservice to the cause of educational planning", then matters are more complex for educational planners. It seems absolutely clear that coordinated education and manpower planning is essential, and such planning should reflect the trustfulness of occupational vacancy data and the capabilities of people in light of these vacancy projections.

Although this sounds like a brash advertisement, TWS was designed to provide the policy community with advice they are not now getting from econometric models or the scattered efforts of sociologists and social

psychologists. TWS is designed to use labor demand projections as constraints, and estimate the human consequences of education and manpower programs as a part of total economic and social planning. TWS was designed to be used at all levels of decision making in government; national, state and local.

Since manpower programs are less well known than education, a brief review of their history might be useful to the reader and, at the same time, suggest assumptions upon which current legislation apparently rests. Prior to the Comprehensive Employment and Training Act (CETA) of 1973, manpower programs were centrally administered by the Department of Labor as so-called categorical programs, for example: the Job Corps, the Neighborhood Youth Program, Operation Mainstream and the Manpower Development and Training Act. CETA provided coordinated management for separately administered programs and vested decision making power with the local prime sponsor, within federally established limits. The Youth Employment and Demonstration Projects Act of 1977 is using the prime sponsor under the Department of Labor in attacking structural unemployment for youth. Although it is clear that Congress has called for coordination between the United States Office of Education and the Department of Labor in both the Educational Amendments of 1976 and the Youth Employment and Demonstration Projects Act of 1977, the tendency of programs administered by the Department of Labor has been to place persons in short term, subsidized jobs. Training for new occupations has not been an essential ingredient of manpower programs administered by the Department of Labor.

One might guess the Congress suspects the bias of the Department of Labor, but seems to believe that public service employment with little training is a more useful alternative than intensive training for vacancies which may not exist, preparing persons for jobs they will not accept after completing a program or training persons for occupational vacancies in

which they cannot succeed. Without question, public service employment programs are becoming a part of occupational life in America. Perhaps Congress has decided that, by and large, manpower programs should be converted into public service employment programs, and if the economy develops so it can support all willing workers, there will be a ready pool of unskilled or semi-skilled workers. There seems to be a movement away from the idea of using manpower programs as a springboard to better jobs for those out of the labor market. This assessment of Congressional intent may be incorrect, but since there is no clear policy structure for education or manpower programs as a part of total economic or social planning, it seems as reasonable a policy analysis as any.

TWS was specifically designed in anticipation of the Education Amendments of 1976 and the Youth Employment and Demonstration Projects Act of 1977, to facilitate comprehensive and realistic planning for education and manpower programs as a part of total economic social planning. Hopefully, it will facilitate the development of an explicit and comprehensive policy for education and manpower programs which is enlightened by both the human consequences of such policy and understandings of economic growth patterns. Beyond any doubt, the intentions of the Congress are in the best interests of the people. The transition to work process in an open and decentralized society is just too complex to be represented "within a human mind model" for inspection and analysis. Without computerizing models of complex phenomena for simulation, it is simply not possible to understandingly plan or monitor comprehensive social policy. Isolated and parochial treatment of individual programs without regard to the so-called "big picture" contributes to the creation and maintenance of overlapping and even

contradictory programs. Confused education and manpower policy is about the best one can hope for until the policy community begins to use tools which are equal to the task. Decentralizing funding and program responsibility without developing comprehensive planning and program monitoring tools does not seem like much of a solution for improved education and manpower planning. Beyond that, given the mobility of the work force and aggregate labor demand, local, regional and state planners need both a narrow and national picture. TWS can provide such a coordinated view to regional and national planners.

HOW TWS WORKS

TWS is a model of the career-related decisions persons make. By simulating career-related decisions for a sample of people, TWS estimates the population consequences of a simulated cohort of persons under specific policy conditions.

TWS decisions can be separated into three distinct categories:

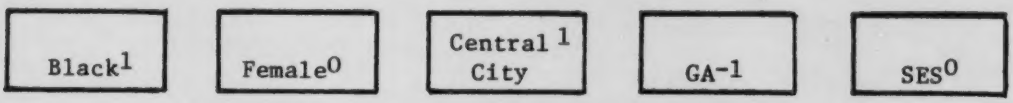
(1) Creation - In life these are decisions usually beyond the control of individuals and determine a person's central characteristics. In TWS they are sex, race, general ability, mechanical ability, socio-economic status of parents (SES) and urbanicity.

(2) High School - These are decisions about the high school programs selected, the length of program, high school completion, etc. Persons of high school age can also decide to participate in a CETA program, become married, have children or collect welfare.

(3) Post High School - These are the major labor market decisions persons must make, e.g., post-secondary school, employed, unemployed, military, part-time employed, etc. Obviously, persons make other career-related decisions like becoming married, having children or getting divorced. These are also included in TWS.

Before describing the decisions which constitute the TWS model of the transition of persons to workers, it is useful to understand how a decision point works in TWS. Assume that a "simulating person" has already been defined by five creation characteristics, sex, race, general ability, SES and urbanicity. This constitutes a person's <u>previous experience</u>.

<u>Previous History</u>



The subscript ^{0} equals the norm or not present for a dichotomous variable, with 1 equal to present or a deviation. GA and SES have a norm of 0 and deviation scores of -1 and +1. Note, we have created a black, male, central city person, whose SES is at the norm and whose general ability is one deviation unit below the population norm.

Here is a decision point: Select A High School Program

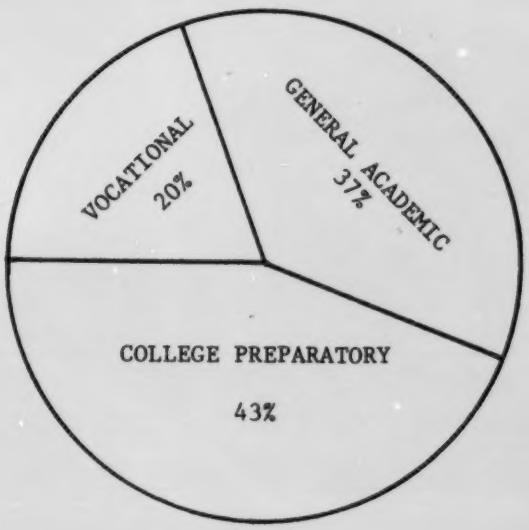
TABLE 1

Reference Group → Constant

Predictors → Black^0, Female^0, Central^0 City, GA^0, SES^0

Choices	Constant	Black^0	Female^0	Central^0 City	GA^0	SES^0
General Academic	37%	+5	-3	+2	-16	-13
College Preparatory	43%	-13	-10	+7	+29	+24
Vocational	20%	+8	+13	-9	-13	-11

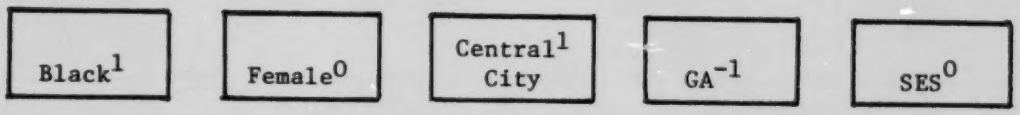
This table says that 37% of the reference group will select a general academic program, 43% a college preparatory program and 20% a vocational program. The constant percentages are the reference groups' probabilities at a decision point. The reader could figure out the reference group from the predictors, i.e., white, male, non-central city, at the norm on GA and SES. His probability of selecting a high school program could be portrayed as:



WHEEL OF FORTUNE

FIGURE 1

Now, let's see how this works for the person we previously created, namely:



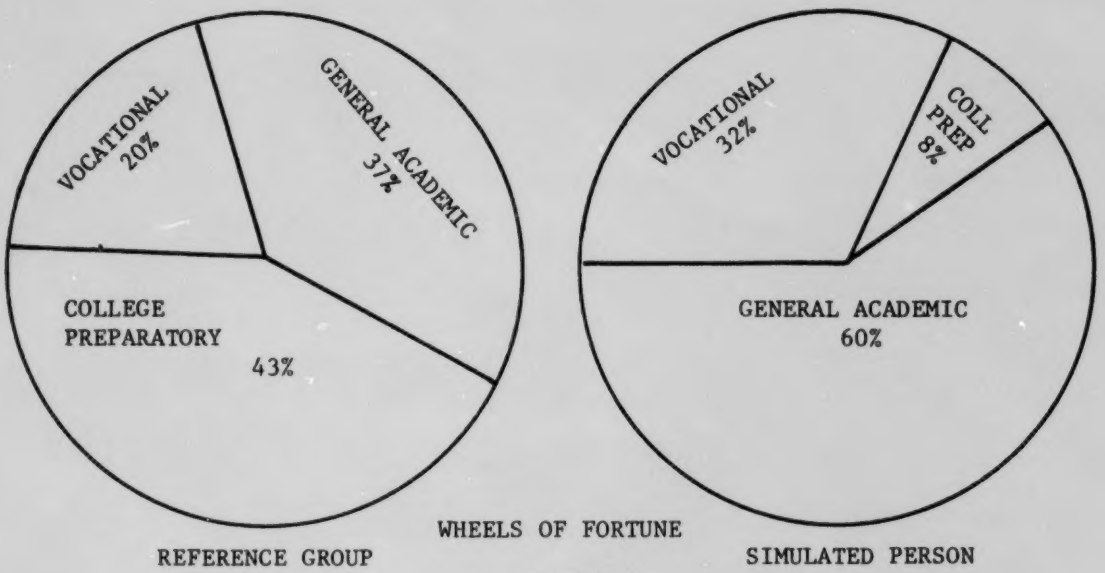
If one thinks of the subscripts as a person's scores or a previous history brought to a decision point to be multiplied by the deviation values (weights) of each predictor, it is easy to calculate a new wheel of fortune for a simulating person. Here are the results of these calculations for the simulating person:

TABLE 2

	SCHOOL PROGRAM SELECTED			
	GENERAL	COLL PREP	VOCATIONAL	
Black	+5	-13	+8	= 0
Male	0	0	0	= 0
Central City	+2	+7	-9	= 0
GA[-1]	+16	-29	+13	= 0
SES	0	0	0	= 0
Summed Deviation Probabilities	+23	-35	+12	= 0
+ Reference Group Probabilities	+37%	+43%	+20%	= 100%
Probabilities for Simulated Person	+60%	+8%	+32%	= 100%

The algebraically summarized probabilities across choices at a decision point for a developing person must equal 100%. The computer makes proportionalizing adjustments when probabilities for a choice are greater or less than 100%, due to errors in setting weights.

Here are the wheels of fortune for the reference group person and the unique individual we created:



REFERENCE GROUP WHEELS OF FORTUNE SIMULATED PERSON

FIGURE 2

Two rules are important:

(1) It is a zero sum game, since each choice is mutually exclusive. The predictors must equal 0, i.e., being black increases the chance of attending a general program by 5%, decreases the chance of attending a college preparatory program by 13% and increases the chances of attending a vocational program by 8%;

(2) GA and SES scores are in deviation units. Since our simulating person has a -1 GA, we multiply the -1 times the -16 weight in the Select a High School Program decision table. Since (-1 x -16) = +16, this has the effect of increasing his chance of attending a general academic program by 16%.

In summary, the reference groups' probabilities among choices are determined by the constant. The computer uses a random number generator to decide among choices. If a simulating person deviates from the reference group, the weights in the predictor which describe the deviation are algebraically added to the constant weights or a set of unique conditional probabilities are established for each simulating person at each decision point, depending upon his or her previous experience. Interaction predictors are possible. At a particular decision point, there might be a unique set of weights for black females, who have a high GA and graduated from a 4-year college with a major in engineering.

TWS consists of about 200 decision points, with about 10 predictors per decision point. The average simulation is for 3500 persons, which requires over one quarter of a million calculations per simulation. This is a way of reinforcing the total dependency of TWS (and other models) on advances by computing system designers. Unlike most computer applications which are organized to make the existing social system operate more efficiently, TWS is a computer application to help persons redesign society through education and manpower programs.

There are several ways to make a policy change in TWS:

(1) The easiest way is to simply change weights on a decision table which describes a decision point. This can be challenging with complex decision tables in the heart of the TWS model. A simple example would be to eliminate all high school general academic students on the following table, e.g., simply inserting 0's for the constant and predictors for General

Academic Programs. Other weights and constants on the decision tables must be adjusted. This is a simple task on a computer terminal.

TABLE 3

Reference Group → Constant

Predictors →

Choices	Constant	Black^0	Female^0	Central^0 City	GA^0	SES^0
General Academic	37%	+5	-3	+2	-16	-13
College Preparatory	43%	-13	-10	+7	+29	+24
Vocational	20%	+8	+13	-9	-13	-11

It should now be possible to conceive of TWS as about 200 decision tables, each representing important career choices. Each decision table includes constants and weights for predictors, which create a unique set of conditional probabilities for each simulating person, depending on past experience. This conception of TWS provides a view of its enormous flexibility and scope.

(2) The second level of policy change alternatives requires adding new predictors to a decision point. A predictor can be any combination of experiences in the past. The following table is from the replicator section of the model, i.e., a choice a person can face each year. It demonstrates the range of predictors that can be used on a decision table.

TABLE 4

DECISION 32A	DECISION NAME: Labor Market Selection				PERSONS AT DECISION POINT: (1) Full Time Employee Last Year								
	PREDICTORS												
CHOICES	CONSTANT	LABOR MARKET TIGHTNESS	FEMALE	BLACK	WELFARE LAST YEAR	YEARS EMPLOYED FULL TIME	THIS YEAR ADULT ED	MARRIED	SEPARATED +FEMALE+ CHILDREN	MALE + MARRIED + CHILDREN	FEMALE + MARRIED + CHILDREN	GA	FEMALE MARRIED	MALE BLACK
CETA	01	+5	0	+1	+1	0	-2	0	-1	-2	-2	0	0	0
FULL TIME EMPLOYED	78	-15	-7	-13	-1	+2	+10	+3	+8	+10	-10	+4	-30	+5
PART TIME EMPLOYED	5	+5	+3	+4	0	0	+2	0	-3	+2	-2	+1	-2	0
NOT EMPLOYED	16	+5	+4	+8	0	-2	-10	-3	-4	-10	+12	-5	+32	-5
MILITARY	0	0	0	0	0	0	0	0	0	0	0	0	0	0

REFERENCE GROUP:

(1) Normal on Labor Market Tightness
(2) Male
(3) White and Non-Black Races
(4) Not on Welfare Last Year
(5) Employed Only Last Year
(6) No Adult Education This Year
(7) Not Married
(8) Not Separated
(9) No Children
(10) Normal on GA

(3) Reconstructing TWS models could mean adding new decision tables or choices within existing decision tables. For example, a social psychologist might want locus of control as a creation characteristic, and a subsequent predictor. Remember, any previous experience can become a future predictor. Model reconstruction might be necessary for some policy experiments.

(1) There are 13 separate predictors for the 5 labor market choices. Each year a simulating person develops new experiences and qualifies for new predictors and faces a new set of conditional probabilities at a decision point. Labor market tightness works like GA and SES, when it is tight or +1, it drives persons away from full-time employed. This predictor appears on many decision tables.

A Review of the Model

It is now appropriate to review the TWS model in some detail. After the creation decision tables, the first set of decisions are programs in high school.

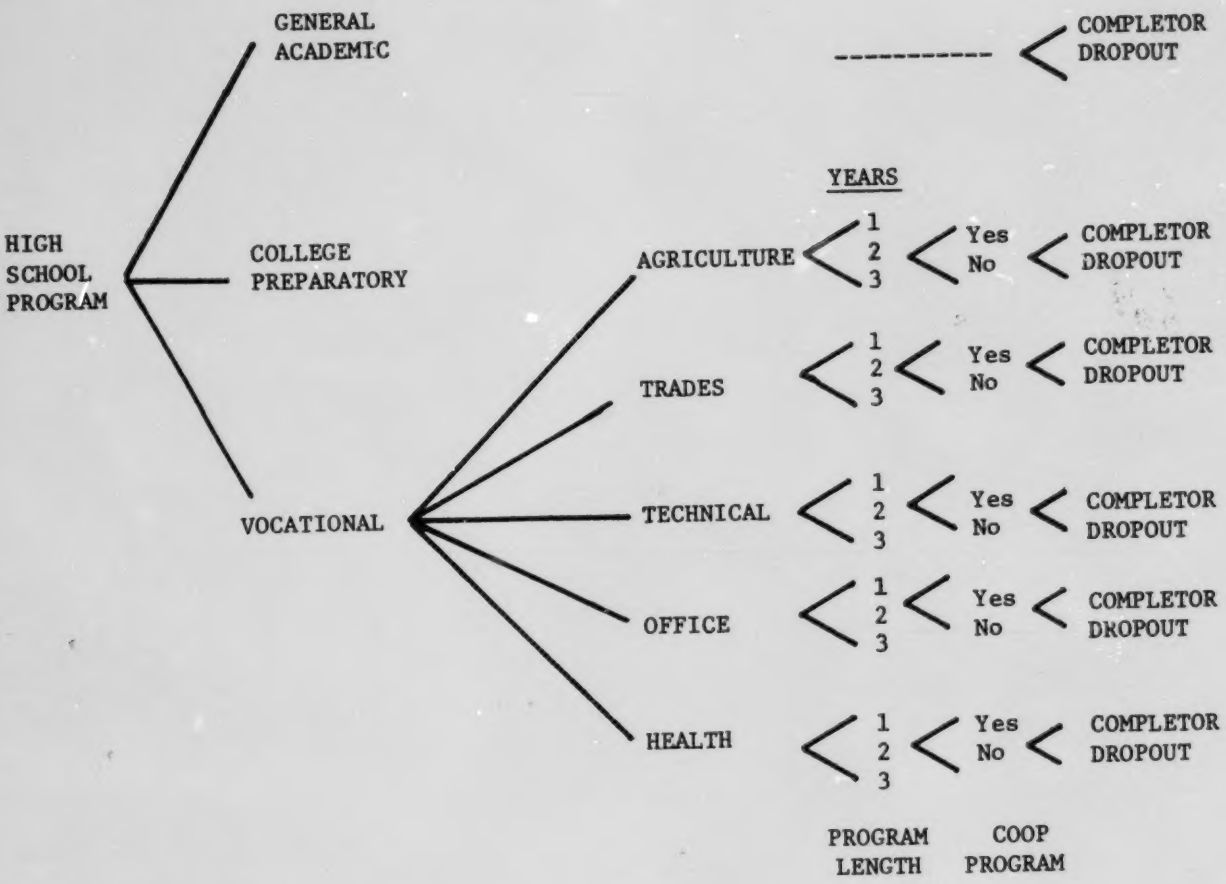


FIGURE 3

The following costs are assigned to students who select a high school program. The costs are an estimation of non-capital, per pupil expenditures, grades 1-12.

Completors	
General Academic	$12,500
College Preparatory	$13,000
Vocational	$14,500
Dropouts	$10,000

The education research community should note that TWS includes two program variation choices, i.e., program length and cooperative pro-programs. These are used as predictors on subsequent decision tables. If educational researchers can "scratch up" evidence that program alternatives make a difference in subsequent career behavior, they can be included in TWS. Figure 3 displays several decision tables which include: selecting a high school program; selecting a specific vocational-technical program; selecting a 1-year, 2-year or 3-year vocational program or a cooperative vocational program; and deciding to become a high school dropout or completor. The computer records the decision and associated cost of each simulating person. The decision is based on the conditional probabilities of each unique person at each decision point and a random number generated by the computer.

While in high school, some students marry. Therefore, all high school students face a marriage decision point.

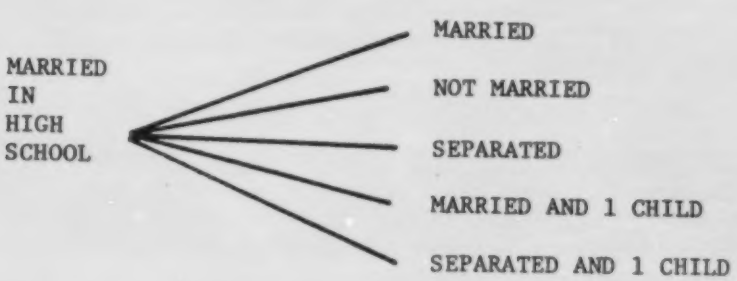


FIGURE 4

A student's high school marital status becomes a predictor of subsequent choices.

Many high school students enroll in a so-called Summer CETA, job program, and that is a within high school decision point. A few high school dropouts enroll in CETA programs before their high school class graduates. In TWS, CETA consists of six regular programs, and one non-existent program used for experimentation. TWS is now being remodeled to include the programs fostered by the Youth Employment and Demonstration Projects Acts of 1977.

The CETA programs are:

(a) Classroom Skill Training: Clients receive occupational skill training in an educational setting.

(b) Work Experience: Clients are assigned to a job for work experience and socialization.

(c) On-the-Job Training: Clients are assigned to an employee for a combination of work experience and the learning of job skills.

(d) Public Service Employment: Clients are assigned to subsidized, public employment jobs.

(e) Direct Placement: Clients are placed directly into the labor market.

(f) Job Corps: Young clients are enrolled in a Job Corps program, a residential learning experience for disadvantaged, inner-city youth.

(g) Classroom Skill Training and Cooperative Work Experience Program: This program is included in TWS, even though it does not exist in reality. It is a proposed program, whereby clients are

enrolled in occupational courses or programs in existing schools, community colleges or 4-year colleges and provided "related" public service employment or work experience while enrolled in these educational programs. The estimated costs for these programs are as follows:

TABLE 5

	GROSS	COST OF PROGRAM	STIPEND	PRODUCTIVITY	NET	LENGTH
1. Classroom Skill Training	$5,080.	$3,000.	$2,080.	0	$5,080.	½ Yr.
2. Work Experience	$3,690.	$1,300.	$2,390.	$1,920.	$1,770.	½ Yr.
3. On-the-Job Training	$4,190.	$1,800.	$2,390.	$1,200.	$2,990.	½ Yr.
4. Public Service Employment	$6,200.	$ 200.	$6,000.	$5,200.	$1,000.	1 Yr.
5. Job Corps	$4,000.	$4,000.	0	0	$4,000.	1 Yr.
6. Direct Placement	$ 500.	$ 500.	0	0	$ 500.	0
7. Classroom Skill Training & Coop Work Experience	$7,780.	$3,000.	$4,780.	$2,600.	$5,180.	1 Yr.
8. Summer CETA Program for Youth	$ 514.	$ 514.	0	0	$ 514.	Several Weeks

Notice that the net costs subtract an estimate of productivity from gross program costs. The programs with a substantial training component have reduced productivity, while manpower programs with little training have a reduced net cost. The CETA decision tree is as follows:

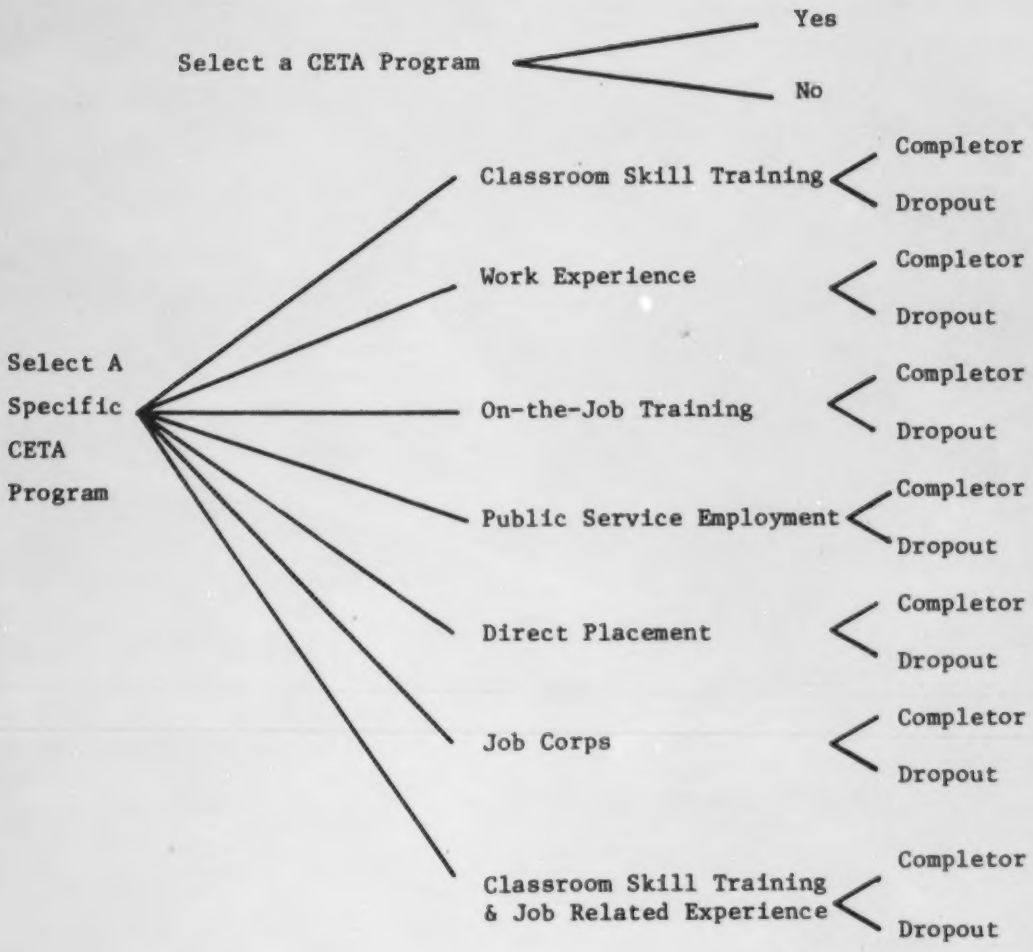


FIGURE 5

With the exception of Job Corps, the CETA decision tree is constant throughout TWS.

High school dropouts are allowed to collect welfare (AFDC) before they would have graduated from high school, if certain conditions are met, namely, female, income below the poverty line and separated with dependents.

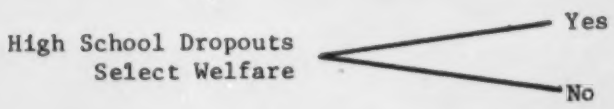


FIGURE 6

After high school, TWS iterates each year for 15 years. All decisions are based on the prior experience of each simulating person. The first set of post high school decisions is as follows:

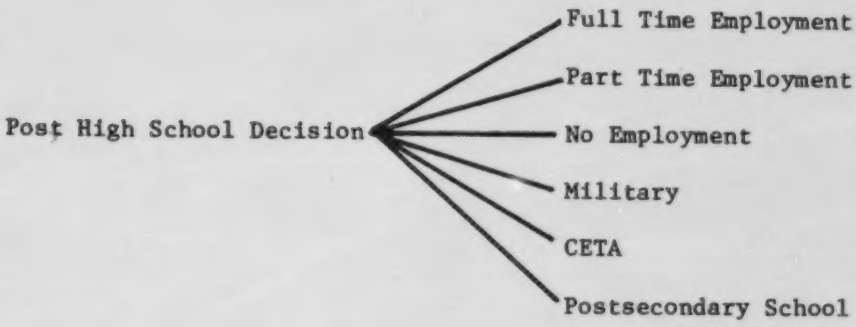


FIGURE 7

When simulating persons make a post high school decision based on prior experience, they face a second set of decisions (military excluded). Persons who select full-time employment, select a job cluster.

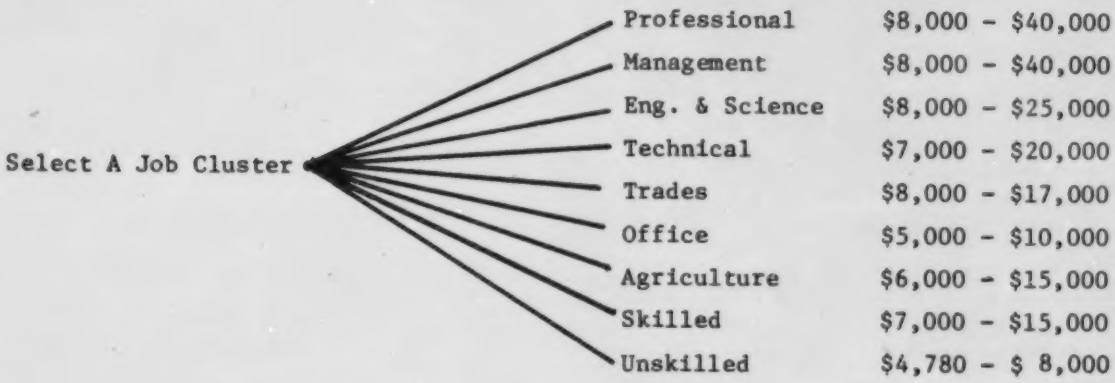

Select A Job Cluster
Professional $8,000 - $40,000
Management $8,000 - $40,000
Eng. & Science $8,000 - $25,000
Technical $7,000 - $20,000
Trades $8,000 - $17,000
Office $5,000 - $10,000
Agriculture $6,000 - $15,000
Skilled $7,000 - $15,000
Unskilled $4,780 - $ 8,000

FIGURE 8

Persons who select part-time employment must determine if they are satisfied or unsatisfied. Unsatisfied, part-time workers are defined as seeking full-time employment, and therefore underemployed. Part-time employed persons earn $2,500 per year.

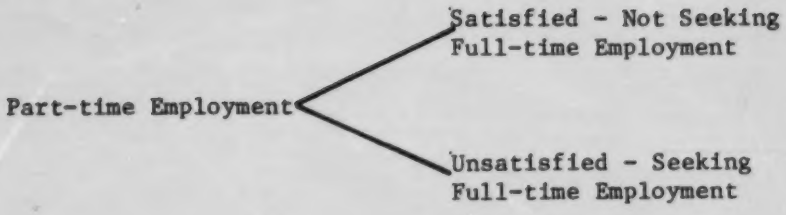


FIGURE 9

Persons who select no employment have three choices:

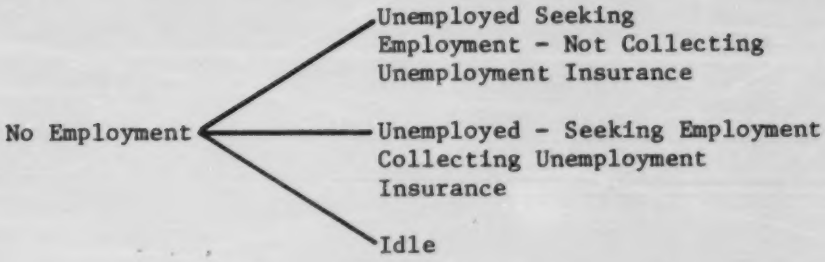


FIGURE 10

High school completors and dropouts cannot collect unemployment insurance, and therefore are banned from this choice immediately upon exit from high school. Unemployment insurance is $4,500 per year. The idle category includes all those persons out of the labor force. It includes housewives and all others who are not working or seeking work.

The CETA choices were previously described. After high school age, the probability of entering Job Corps is greatly reduced.

Postsecondary school is a fairly complex decision point:

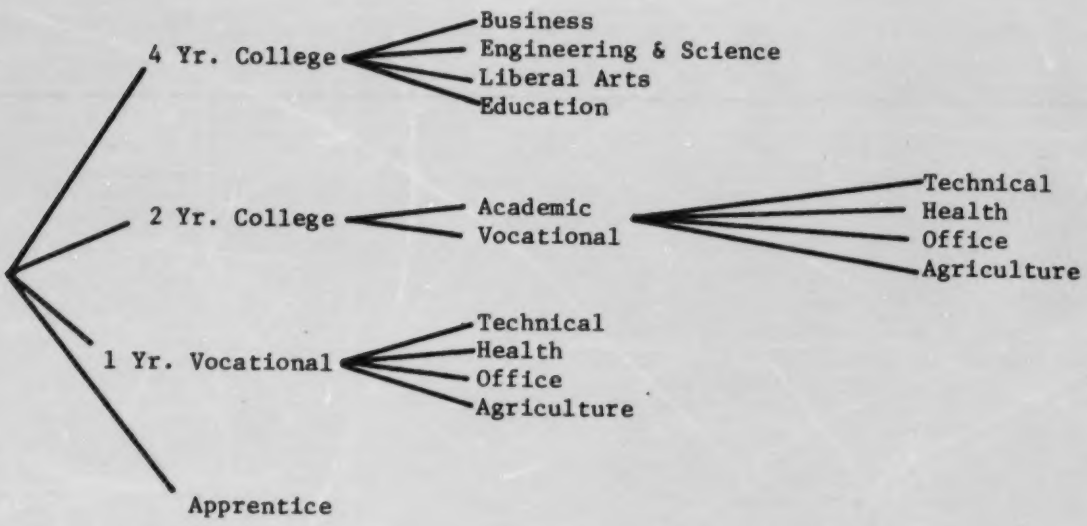


FIGURE 11

Of course, students select programs and become dropouts or completors as a result of their previous "creation" and high school experience. With the exception of apprentices, postsecondary students accumulate an annual opportunity cost of $8,500, $6,000 they would make if in the labor market and $2,500 tuition. Apprentices earn $7,000 per year.

Each year, simulating people face three marital decisions:

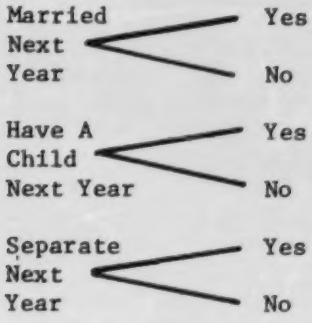


FIGURE 12

The current version of the model does not allow people to remarry.

If simulating persons meet certain conditions, they can collect welfare. This decision is faced each year. TWS attempts to replicate AFDC payments. With the exception of the first year out of high school, all simulating persons face an adult education decision. The choices are:

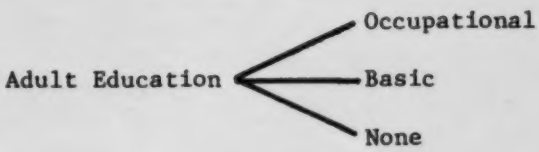
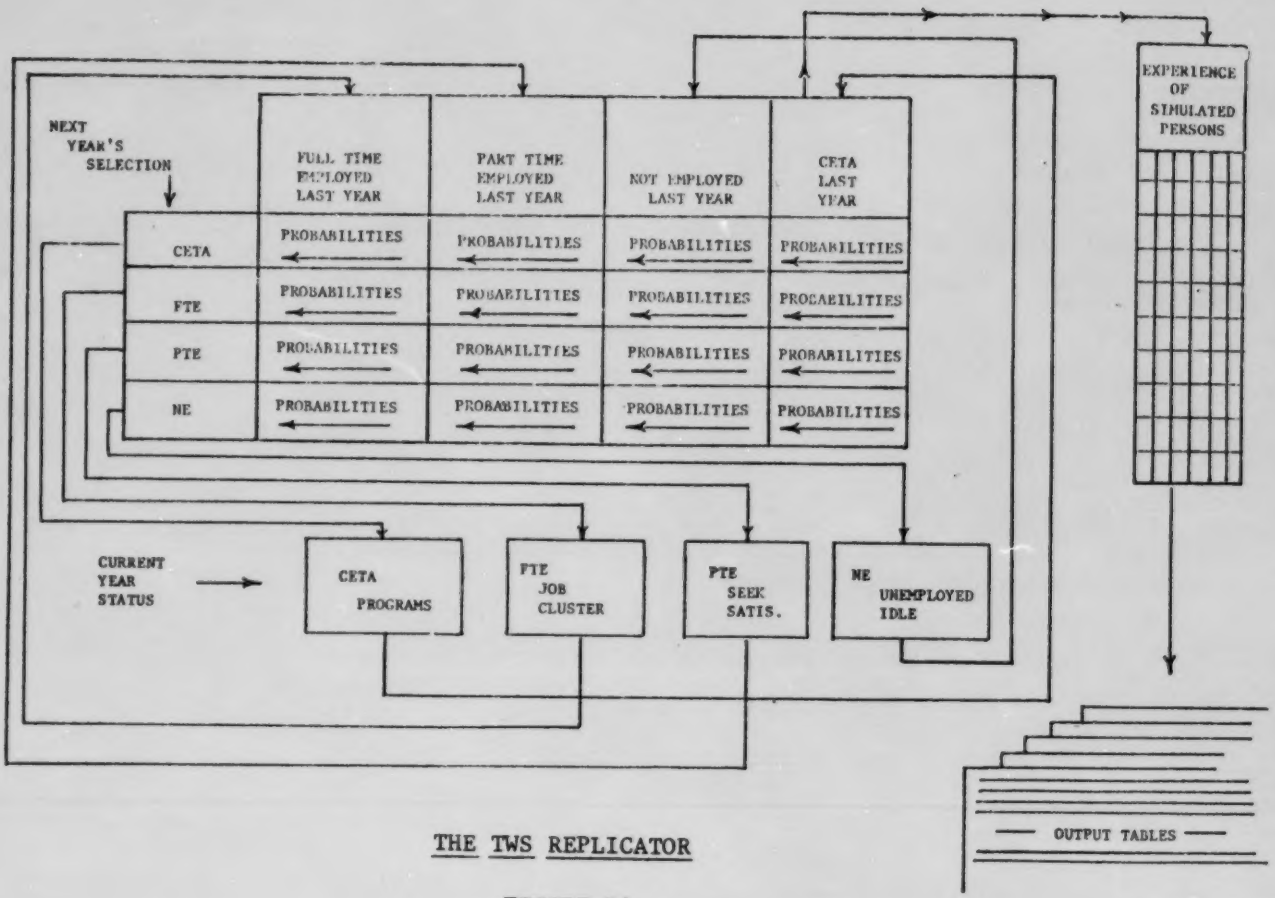


FIGURE 13

Persons in postsecondary education are forbidden from this decision point. Adult education annual social costs are: Adult Basic = $108; Adult Occupational = $1,000.

Figure 14 summarizes the replicator section of TWS, i.e., the post high school section. It is enormously simplified, but suggests that based upon a person's current status, a unique set of conditional probabilities are established for each simulating person's next year's decisions. The computer calculates the probabilities for each choice, and records each decision for use as a future predictor as well as associated information, for example, social costs of graduating from high school. The experience of a sample-cohort of simulated persons is remembered by the computer, and important descriptions of simulation runs are printed out on output tables. It really is as simple as that.



THE TWS REPLICATOR

FIGURE 14

TWS Validity

TWS creates a single cohort of persons from age 15 to about age 33. TWS is now organized as a sample of the national population. Status simulation runs for the national sample can be compared with policy change runs.

Created cohorts represent a random sample of the 10th grade population. The 10th grade class or population represents about 98% of the non-institutionalized population, so that the current status model of TWS is a reasonable estimate of the 15 year old cohort in America in 1970. This is because the data on which most of the created cohort was validated was the National Longitudinal Survey conducted by the National Center for Educational Statistics, corrected to include dropouts. There are about 4,000,000 persons in the 10th

grade cohort, and TWS weights values created by the simulated sample back to the cohort population values by multiplying the inverse of the simulated sample (whatever it may be) over 4,000,000. Naturally, the larger the simulated sample, the less the error. TWS does have a capability to clone simulees when the count is low to generate a stable estimate of population values at crucial decision points. Such a discussion is beyond the scope of this paper.

There are really three separate validity concerns with a model. One is structural validity, or the degree to which the structure of the model "apes" the social or physical system being represented. This is judgmental and really the essence of model construction. It requires intimate knowledge of the system under study. A good model is structurally explicit, parsimonious and faithful representation of the important relationships within the referent system.

Component part validity is the degree to which the component parts of the model resemble the parts of the referent system being modeled. Decision tables are the component parts of TWS. For the status run, there are several alternatives for validating the weights of each predictor on each decision table. In fact, the design of the TWS model by decision tables allows for the pulling together of disparate data bases into a single planning environment, either for status runs or planning experiments. To parameterize predictor weights for a decision table, TWS users can call upon judgment or data. Data sets to parameterize TWS can be longitudinal, time series or cross sectional. The data used to parameterize most TWS decision tables through college are based on the National Longitudinal Survey for constant terms and for predictor weights. Predictor weights were obtained by comparing the percentages of predictors with the constant

percentages for the reference group. For example, the predictor weights for female are obtained by subtracting the column percentages of white, female, non-central city from white, male, non-central city (reference group), thus controlling for the confounding effects of race and central city on the sex predictor. It is possible, and perhaps desirable, to use more elegant statistical methods to parameterize decision tables, e.g., path analysis, discriminant analysis or biserial regression. Frankly, I am not sure about the added value of such analysis and could not find anyone who was. The crosstab approach (with controls) is at least non-mysterious and transparent. That was my intention.(2)

Whole model validation is accomplished by changing parameters in the model until the output resembles real world conditions. For the current version of TWS, TWS(1), the national model was validated against labor market data averaged over 1972-75, to avoid validating the model against an atypical year. TWS whole model validation was for white and black males and females. The parameters established from empirical data sets were held constant, while weights for predictors in the replicator were judgmentally manipulated until TWS(1) was producing real world results.

TWS Output Tables

As an introduction to the section of this summary description of TWS which presents outcomes from policy experiments, a presentation of the output tables should be helpful. TWS was developed to produce four output tables for each simulation run. Because about 13% of the sample is black, two simulations are run for each policy experiment, one for all (2,000) and a second for blacks (1,500). This produces sufficient numbers to stabilize important sample statistics.

(2)Other weights were based on the Current Population Survey or determined judgmentally.

The explanation will reference output tables generated by the validated status run of TWS(1) for all. The numbers for blacks in the all run are too small to be a reliable estimate of population values, in most instances. The purpose of this section is not to discuss the significance of the numbers on the output tables, but to explain how they are calculated. Understanding the output tables is crucial to using TWS.

TABLE 6

NUMBER OF YEARS SIMULATION 15

AVERAGE PER PERSON OUTCOMES FOR SIMULATION COSTS AND EARNINGS ARE ANNUAL DOLLARS

	SEX		SES			ABILITY			RACE		ALL
	MALE	FEMALE	LOW	MEDIUM	HIGH	LOW	MEDIUM	HIGH	BLACK	WHITE	
GROSS EARNINGS	6660	3749	4706	5246	5746	4723	5230	5716	4934	5276	5215
SALARIES WAGES	6460	3120	4032	4071	5532	4105	4065	5463	4146	4900	4802
SOCIAL COSTS	1230	1606	1631	1400	1356	1535	1410	1433	1620	1430	1456
WELF AFDC COSTS	22	447	461	101	62	390	192	120	430	200	233
GROSS CETA COSTS	63	78	86	68	56	99	57	61	140	59	70
NET CETA COSTS	32	43	49	35	27	58	28	30	80	30	37
UNEMPLOYED COSTS	114	121	139	111	104	133	124	90	130	114	117
COLL OPP COSTS	549	531	272	541	848	100	542	932	219	592	540
YEARS FT EMPLOY	10.7	5.2	7.7	8.6	9.1	8.0	8.6	8.6	8.1	8.5	8.4
YEARS PT EMPLOY	.9	1.4	1.1	1.2	1.1	1.0	1.2	1.2	1.1	1.1	1.1
YEARS UNEMPLOYED	.8	.9	1.2	.8	.7	1.2	.8	.6	1.3	.8	.9
YEARS WELFARE	.1	1.7	1.7	.7	.3	1.5	.7	.5	1.7	.8	.9
YEARS CETA	.2	.3	.3	.2	.2	.3	.2	.2	.5	.2	.2
YEARS IDLE	.8	5.5	4.1	3.0	2.2	4.0	3.0	2.5	3.4	3.1	3.1

Table 6 shows per capita data. Each number is an arithmetic average. For example, $4,802 is the average, annual, per capita salaries and wages for all 2,000 simulated persons for all 15 years of the simulation.

For each year, the salaries and wages of each person are added together, even if they were 0. This is the numerator. The denominator is the total number of simulated persons, summed, for each of the 15 years. Four thousand eight hundred two dollars ($4,802) is the average, annual per capita salaries and wages for the simulated sample.

All the other salaries and wages are calculated in the same way, except the descriptors in the columns restrict the persons counted in the denominator and their related salaries in the numerator. For example, $4,032 are the average, annual per capita salaries and wages for all persons whose parents had a low socio-economic status, while $3,120 are the average, annual salaries and wages for all women. All earnings or cost values are average, annual per capita values.

Number of years full-time employed is the total number of average years employed over the entire 15 year simulation for a particular subgroup. They are not annualized. All males were employed for an average of 10.9 years over the 15 year simulation, while all females were employed for an average of 5.9 years over the same 15 years. The same convention applies to years part-time employed, years unemployed, years welfare, years CETA and years idle. The average woman was idle for 5.5 years over the 15 years under status conditions, the average male for only eight-tenths of one year.

Gross earnings include all salaries and wages, CETA stipends, welfare benefits, unemployment benefits and military pay. Salaries and wages only include income earned while working in an occupational cluster full time and payment for part-time work or military pay. The distinction is that gross income includes dollars redistributed to persons through government programs, generated by a tax on salaries and wages, as well as other government revenue

sources. The distance between salaries and wages and gross earnings is an important social indicator.

Social costs include all welfare payments, gross CETA costs, unemployment costs, the social cost of college ($2,500 per pupil, per year), adult education costs and secondary and elementary school costs. College opportunity cost includes both college tuition ($2,500 per year) and an estimation of what persons might have earned if they were not in college, so-called foregone earnings.

The social cost to salaries and wages ratio is a critical indicator used for analyzing the effect of policy change. TWS social costs do not include the military, the fire department and the many other government services. Since social costs are an understatement, their ratio to salaries and wages should be appropriately regarded. TWS is hardly a full-blown econometric model which accounts for all private and government transfers under various policy conditions. It does attempt to estimate important relationships under various policy conditions.

Table 7 describes total costs or earnings for all 15 years of the simulation. All dollars are in millions of dollars. All dollars are weighted back to population values. For example, if the sample size is 2,000, the per capita gross earnings from Table 6 are multiplied by the inverse of 2,000 over 4,000,000, and multiplied by 15 years. Remember 4,000,000 is the total number of persons in the 10th grade population cohort the simulation sample represents. Two hundred eighty-eight billion, one hundred forty-four million dollars ($288,144,000,000) are the population salaries and wages for all persons for all 15 years. TWS calculates a percentage of members of subgroups as defined by the intersection between row and column, so that $195,170,000,000 represents

the total 15 year salaries and wages for about 2,000,000 males. High school costs include an estimation of costs for grades 1-12, as previously described. Dropout costs are included in social costs, but not in high school costs.

TABLE 7

NUMBER OF YEARS SIMULATION 15

TOTAL OUTCOMES FOR SIMULATION

1 COHORT

	SEX		SES			ABILITY			RACE		ALL
	MALE	FEMALE	LOW	MEDIUM	HIGH	LOW	MEDIUM	HIGH	BLACK	WHITE	
GROSS EARNINGS	201206	111699	82746	142747	87410	83042	138456	91406	40461	272444	312905
SALARIES WAGES	123170	92974	70076	133090	84149	72174	120606	87363	34702	253442	288144
SOCIAL COSTS	37102	50229	28679	38095	20637	26995	37492	22924	13567	73044	87412
WELF AFDC COSTS	692	13323	8120	4946	948	7001	5003	1931	3671	10314	14015
GROSS CETA COSTS	1906	2341	1523	1060	656	1756	1511	980	1175	3073	4248
NET CETA COSTS	967	1300	869	979	419	1030	753	485	674	1593	2268
UNEMPLOYED COSTS	3446	3626	2447	3032	1592	2348	3284	1439	1160	5912	7073
COLL OPP COSTS	16591	15026	4793	14721	12902	3178	14330	14908	1835	30582	32418
ADULT EDUC COSTS	603	591	341	573	281	370	569	254	166	1029	1195
COLLEGE COSTS	4879	4654	1409	4329	3794	934	4214	4384	539	8774	9534
HS GENERAL COSTS	81249	70249	52499	66999	24999	52999	71999	26499	23749	127749	151499
HS COLLEGE COSTS	104519	82939	13259	91779	82419	8319	84499	94639	5719	181739	187459
HS VOCATION COST	47559	80909	52199	56259	20009	51909	50579	17979	21459	107009	128469

NOTE: ALL COSTS AND EARNINGS ARE IN MILLIONS OF DOLLARS

Table 8 is the same as Table 7 except that a cohort is added each year. The purpose of this table is to show the cumulating effect of a social policy over a period of 15 years. Again, all dollars are in millions of dollars.

TABLE 8

NUMBER OF YEARS SIMULATION 15

TOTAL OUTCOMES FOR SIMULATION

ADDED COHORT EACH YEAR

	SEX		SES			ABILITY			RACE		ALL
	MALE	FEMALE	LOW	MEDIUM	HIGH	LOW	MEDIUM	HIGH	BLACK	WHITE	
GROSS EARNINGS	1366986	798125	588593	990770	585747	602252	965518	597339	285514	1879597	2165111
SALARIES WAGES	1313748	679096	509767	923132	559946	528039	894797	570008	245576	1747269	1992845
SOCIAL COSTS	587646	576509	324220	481945	277989	308794	474417	300944	152631	931524	1084156
WELF-AFDC COSTS	3710	71442	45160	25046	4954	39339	26665	9155	21892	53268	75161
GROSS CETA COSTS	16339	18412	13010	14720	7020	14533	13193	7024	9712	25039	34752
NET CETA COSTS	8732	10398	7599	7910	3620	8705	6931	3413	5517	13613	19130
UNEMPLOYED COSTS	30320	32156	21113	27116	14246	20159	28961	13355	9314	53162	62477

NOTE: ALL COSTS AND EARNINGS ARE IN MILLIONS OF DOLLARS

Adding the earnings or costs for an additional 10th grade cohort each year does display costs of social programs accurately for 15 years, but it distorts the social cost to salaries and wages ratio. This is because the cohorts being added incur all school costs, for example, but are only in the labor market for a few years. In fact, the fifteenth added cohort has no time to earn salaries and wages, and only adds to social costs. Nonetheless, Table 8 does provide indications of long-term effects of a program on more than a single cohort over 15 years, which is its purpose.

Table 9 is repeated for all persons; white males, white females, black males and black females. Table 9 for <u>all</u> will be described. The reason TWS produces five Table 9's for <u>all</u>, and <u>white</u> <u>and</u> <u>black</u> <u>males</u> <u>and</u> <u>females</u> is for whole model validation <u>and</u> to be able to test the effects of various social policies upon important target populations.

TABLE 9

HIGH SCHOOL EXPERIENCE

	ALL PROGRAMS			VOCATIONAL PROGRAMS				
	ENROLLMENT	COMPLETORS	DROPOUTS	COOP	1 YR	2 YR	3 YR	SUMMER CETA
GENERAL	36.9	82.2	17.8					7.60
COLLEGE PREP	37.1	97.3	2.7					
VOCATIONAL	26.1	84.9	15.1	8.6	40.5	33.0	18.6	

YEARS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	15 YEAR AVERAGE
POST SEC	39.00	20.10	17.30	14.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	6.5767
1 YEAR	5.30	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	.3533
2 YEAR	13.00	9.05	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	1.4700
APPRENT	1.20	1.10	1.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	.2200
4 YEAR	19.50	17.95	16.30	14.25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.5333
FULLTIME	32.05	40.85	47.60	48.80	57.90	59.35	59.75	60.45	60.15	62.35	61.65	62.90	63.10	62.95	64.15	56.2667
PROFESSN	0.	0.	0.	0.	1.45	1.70	1.70	1.50	1.65	1.75	1.80	1.65	1.45	1.70	1.80	1.2100
MANAGER	0.	.70	1.90	2.05	6.15	6.25	6.40	7.20	6.40	7.10	6.75	7.30	6.80	6.25	6.60	5.1900
ENG.-SCI	0.	0.	0.	0.	.80	.95	.90	1.00	.95	1.10	.90	.95	.95	1.15	1.05	.7133
TECHNICN	3.85	5.80	7.70	8.30	9.00	8.85	9.05	9.15	9.00	9.35	9.80	9.60	9.70	9.60	10.35	8.6067
TRADES	0.	0.	0.	.60	.55	.60	.50	.55	.40	.50	.55	.50	.50	.45	.50	.4267
OFFICE	9.65	9.40	9.95	9.75	10.40	10.40	10.00	9.75	9.35	9.45	9.00	10.00	9.90	10.15	9.80	9.7967
AGRICULT	1.25	1.15	1.50	1.50	1.65	1.70	1.70	1.70	1.45	1.35	1.60	1.60	1.70	1.60	1.55	1.5333
SKILLED	7.85	10.95	12.90	12.60	13.45	13.95	14.45	14.55	15.65	15.70	15.45	15.30	15.90	15.70	16.00	14.0267
UNSKILLD	9.45	12.85	13.65	14.00	14.45	14.95	15.05	15.05	15.10	16.05	15.80	16.00	16.20	16.35	16.50	14.7633
PARTTIME	8.25	5.25	5.55	6.40	5.65	7.30	7.65	8.30	8.80	6.95	7.65	8.35	8.75	9.60	8.85	7.5533
UNEMPLOY	8.55	8.75	7.65	6.80	10.40	6.70	5.75	5.15	3.90	4.50	4.00	3.75	3.85	3.00	3.25	5.7867
WELFARE	1.20	1.70	2.05	2.50	3.30	4.60	5.35	5.65	7.35	8.40	8.45	9.10	9.95	10.15	10.00	6.0367
IDLE	8.75	13.25	16.65	19.35	21.20	23.25	23.60	23.85	24.95	23.95	24.75	23.60	22.95	21.75	22.40	20.9500
MILITARY	2.15	2.60	3.20	3.30	3.90	1.90	1.45	.90	.80	.30	.15	.15	.10	.10	.05	1.4033
ADULT ED	0.	1.95	3.05	3.30	3.15	3.75	3.30	3.25	3.35	3.00	3.30	2.80	3.30	3.00	2.90	2.0933
CETA TOT	1.25	1.35	2.25	1.15	1.05	1.65	2.05	1.45	1.55	2.05	1.95	1.35	1.45	2.00	1.45	1.6000
CLASS	.15	.30	.25	0.	.25	.30	.30	.30	.35	.40	.45	.30	.30	.40	.15	.2000
CLASS WE	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
WORK EXP	.65	.60	.90	.90	.30	.90	.95	.75	.55	.95	.95	.75	.70	.80	.60	.7500
ONTHEJOB	.20	.05	.25	.05	.05	.15	.20	.05	.15	.10	.05	.05	.05	.05	.25	.1133
PUBLIC S	.10	.25	.65	.15	.35	.15	.35	.25	.35	.50	.35	.15	.20	.55	.30	.3100
DIRECT P	0.	.15	.20	.05	.10	.15	.25	.10	.15	.10	.15	.10	.20	.20	.15	.1367
JOB CORP	.15	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	.0100
UNEMPLOY RATE	17.50	15.93	12.50	10.92	14.06	9.13	7.06	6.92	5.35	6.10	5.46	5.00	5.09	4.90	4.26	8.2134

With the exception of the unemployment rate, all values in Table 9 are percentages of the total sample. At the top of the table are the percentages of students enrolled in general academic, college preparatory and vocational programs and the percentage of completors and dropouts in each program. Also displayed are the percentages of all vocational students who are enrolled in a vocational program and the percentages enrolled in 1, 2 and 3-year vocational programs. The Summer CETA percentage describes the percentage of high school-age youth enrolled in a Summer CETA Program for Youth.

Below these data are sixteen columns, one for each year of the simulation and one which displays averages for all fifteen years. Each row is described by an abbreviated descriptor which specifies the values within the row. The percentages are on a cohort basis, for example, during the first year 32.05% of all simulated persons are employed full time. The columns add to more than 100%, as simulating persons may collect welfare and be in adult education while being in another labor market activity. All other row categories are mutually exclusive, with full-time employed a summation of all the occupational clusters and the CETA total including all CETA programs. The 15 year average is the average percentage for the entire sample over the entire simulation. For example, 56.2667% of the entire population was employed full time (on average) for each year of the 15 year simulation. Since the 15 year average percentages include calculating the count of persons in each row category each year, it draws upon about 30,000 sample cases for estimating percentages in each row category. It is, therefore, a more stable statistic than the percentages for each of the 15 year rows, which are a function of about 2,000 persons.

Class WE is the experimental CETA program called Classroom Skill

Training and Cooperative Work Experience Program. Under status conditions, there are no enrollees in this program. The unemployment rate is the number unemployed divided by the number unemployed plus the number part-time employed plus the number full-time employed. For example, the unemployment rate was 8.3% averaged over the entire 15 years for all, but 17.5% for the first year out of high school. All Table 9's are exactly like the all Table 9, in form. The data within each table describes the simulation outcomes for a target group named by the heading on the specific Table 9.

As a way of concluding this descriptive section for TWS and introducing several policy experiments, an assessing statement about the validity of the model seems appropriate. TWS(1) is really composed of 3 separate sectors, a creation sector, a school sector and a labor market sector. The decision tables which describe the sorting of students into secondary school programs and through the first labor market selection for the first year out of high school are fairly well validated. The CETA component of TWS seems about as well validated as current data permit. A more general way of describing component part validation is to say that TWS(1) presents an empirically valid description of how youth sort themselves through high school and into their first year of post high school activity.

The entire model has been validated against Table 9 distributions for white males, white females, black males and black females. These distributions were full-time employment, idle, unemployment rate and CETA. TWS is probably weakest in the labor market sector of the model. Even though the weights for predictors which define a non-reference group appear to be logical, more work should be done to determine their empirical soundness. Both the logic and the weights of the labor market replicator were constrained by budget and schedule. Longitudinal data files which were assembled

for analysis as part of the project which supported TWS development[3] and data of the Department of Labor and Commerce could be used in more careful validation of the national model. Of course, to use TWS at a state or local level, state or local data should be used to parameterize TWS.[4]

It is the belief of the author that although further work would result in more accurate population estimates, the direction of the movement of output values is correct, as is the order of magnitude. This is another way of stating that the policy experiments are probably a reasonable representation of the consequences of the education and manpower policies described. If the TWS model seems to provide a useful new tool to the policy community and the social experiments are sufficiently interesting, it is a relatively easy matter to "fine tune" the national model. Such fine tuning is beyond the scope of the exploratory effort.

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[3] The longitudinal data files are Project TALENT and the American Council on Education. These files have been turned over to the United States Office of Education. Preparing them for analysis is a major task. An "analysis ready" file of NLS has also been turned back to USOE.

[4] The work of the Urban Institute should be of great value in stabilizing the labor sector section of TWS, particularly Charles Holt's "Modeling A Segmented Labor Market" (1974). They have prepared an excellent annotated bibliography (April, 1977). The National Longitudinal Survey conducted for the Department of Labor by Ohio State is a rich base from which to stabilize the labor market sector of TWS(1).

TWS EXAMPLE POLICY SIMULATIONS

The purpose of this section is to offer the reader several clear-cut examples of TWS at work. These examples should provide a basis upon which to evaluate TWS as a policy tool for education and manpower planning. This presentation will be followed with several observations by the author about the value of TWS now and in the future.

The policy experiments reported are based on TWS(1). These data are for a national cohort, partially validated against the 10th grade class of 1970. Total expenditure data are weighted back to the entire national cohort population of 4,000,000, and estimate the real costs or benefits to the nation for a single 10th grade cohort. Remember, TWS simulates a single 10th grade cohort and the resulting population values are for the cohort population, not the entire population. This is not at all unlike launching experimental cohorts into the real world and observing differences under various policy conditions. Advanced development of TWS can make the impact of the exogenous world on the experimental cohorts more dynamic.

An Educational Policy

Clearly, public education in America is more than a producer of manpower supply. Citizenship, self-fulfillment, a joyous youth and cultural goals are important educational goals. Nonetheless, education does play an important role in providing persons with skills and credentials for entry into occupational clusters. Accordingly, a rather severe policy was tested on TWS. All high school dropouts were eliminated, all secondary general academic programs were closed, all high school general academic students were transferred to vocational-technical programs and all 2-year community colleges were closed, in favor of one year vocational-technical schools. No other conditions in TWS were changed.

TWS has a capability of increasing or decreasing the demand for labor. An Educational Policy and the other two policies described in this publication are tested under average labor demand conditions, about 8% unemployment. Results from simulating a sample cohort who experienced conditions under An Educational Policy are tested against results of a simulated sample under status conditions.

Table 10 shows some of the outcomes of the policy for all simulated people. Salaries and wages are increased by $167 on an average, annual per capita basis, while social costs are only increased by $42.00.

TABLE 10

Status Conditions Compared to An Educational Policy

Group: All

		Policy Name Status	Policy Name An Educ. Policy	Difference
PER CAPITA	Gross Earnings	$5215.	$5389.	+$174.
	Salaries-Wages	$4802.	$4969.	+$167.
	Social Costs	$1456.	$1498.	+$ 42.

Table 11 shows that while wages and salaries have been increased by about 10 billion dollars for 15 years, social costs have only risen about 2.5 billion dollars. Although the wage to social cost ratio stays about the same (30%), there are more wages and salaries to distribute among the labor force.

TABLE 11

Status Conditions Compared to An Educational Policy

1 Cohort - 15 Years

Group: All

	Policy Name Status	Policy Name An Educ. Policy	Difference
Gross Earnings	$312,905.	$323,398.	+$10,493.
Salaries-Wages	$288,144.	$298,176.	+$10,032.
Social Costs	$ 87,412.	$ 89,908.	+$ 2,496.
AFDC Costs	$ 14,015.	$ 14,501.	+$ 486.
Gross CETA Costs	$ 4,248.	$ 3,804.	-$ 444.
Unemployment Costs	$ 7,073.	$ 7,226.	+$ 153.
Social Cost to Wage and Salary Ratio	30%	30%	In Millions of Dollars

Examining An Educational Policy from a perspective of adding a cohort or graduating class each year (as opposed to estimations based on a single cohort for 15 years) results in a net gain in wages and salaries over social costs of about 80 billion dollars compared to status conditions. This is an understatement of the policy effect, as educational costs are added each year and later cohorts have little time to demonstrate increased earnings.

As one might guess, such a policy is disproportionately effective for blacks. As one might not guess, it appears to be much more effective for black males than black females. The dramatic increase in salaries and wages for black males, compared to the modest increase in per capita social costs, can be explained by the attainment of secondary school skills and credentials

which cause black males to enjoy a labor market success profile more closely resembling white male, vocational school students. The labor market bias against black males remains in TWS for this experiment.

TABLE 12

Status Conditions Compared to An Educational Policy

		Group: Black Males			Group: Black Females		
		Policy Name Status	Policy Name An Educ. Policy	Difference	Policy Name Status	Policy Name An Educ. Policy	Difference
PER CAPITA	Gross Earnings	$5799.	$6482.	+$ 683.	$3941.	$4063.	+$ 122.
	Salaries-Wages	$5548.	$6229.	+$ 681.	$2949.	$3066.	+$ 117.
	Social Costs	$1176.	$1282.	+$ 106.	$1966.	$2068.	+$ 102.
PERCENT OF POPULATION	General Academic Enrollment	57.2 %	.0 %	- 57.0 %	59.1 %	.0 %	- 59.1 %
	General Academic Dropouts	27.6 %	.0 %	- 27.6 %	26.8 %	.0 %	- 26.8 %
	Voc-Tech Enrollment	34.9 %	91.8 %	+ 56.9 %	44.2 %	94.6 %	+ 50.4 %
	Voc-Tech Dropouts	34.4 %	.0 %	- 34.0 %	30.8 %	.0 %	- 30.8 %
	College Prep Enrollment	7.9 %	8.2 %	No Change	4.0 %	5.4 %	+ 1.4 %
	College Prep Dropouts	19.7 %	.0 %	- 19.7 %	6.9 %	.0 %	- 6.9 %
	Postsecondary Enrollment	17.21%	22.64%	+ 5.43%	24.21%	25.17%	+ .96%
	1 Year Voc-Tech	4.92%	17.46%	+ 12.54%	7.43%	20.63%	+ 13.20%
	4 Year College	5.17%	2.72%	- 2.45%	6.19%	2.89%	- 3.30%
	Apprentice	1.29%	2.46%	No Change	1.10%	1.65%	No Change
	Full Time Employment	68.86%	71.28%	+ 2.42%	39.28%	40.69%	+ 1.41%
	Management	2.7 %	1.41%	- 1.29%	1.84%	1.40%	No Change
	Technical	7.75%	16.70%	+ 8.95%	4.21%	5.54%	+ 1.33%
	Trades	.49%	1.06%	No Change	.29%	.48%	No Change
	Office	5.60%	4.95%	No Change	11.35%	16.11%	+ 4.76%
	Agriculture	4.24%	2.63%	No Change	1.88%	.62%	No Change
	Skilled	16.18%	24.22%	+ 8.04%	5.66%	6.47%	No Change
	Unskilled	31.52%	20.00%	- 11.52%	13.61%	9.92%	- 3.69%
	Part-time Employment	6.45%	6.27%	No Change	8.29%	8.89%	No Change
	Unemployed	7.54%	7.04%	No Change	8.51%	8.11%	No Change
	Welfare	1.43%	1.20%	No Change	19.56%	20.00%	No Change
	Idle	8.36%	6.88%	No Change	36.35%	35.93%	No Change
	Adult Education	4.67%	1.93%	- 2.74%	4.5 %	2.05%	- 2.45%
	CETA	2.70%	2.46%	No Charge	3.8 %	3.65%	No Change
	Unemployment Rate	9.10%	8.32%	- .8 %	15.18%	14.06%	- 1.12%

Notes: (1) Two-year colleges omitted by policy. (2) Less than 1% in professional and engineering clusters under both policy conditions, thus omitted.

Although for black males full-time employment increases substantially, it is the huge swing in the occupations black males occupy which

accounts for much of the gain in salaries and wages (see Table 12). For black females, this policy causes a sizeable shift of occupational role encumbents from unskilled to office occupations. However, the sex bias still operates on black women, which probably accounts for a less dramatic change than for black males. This policy reduces the youth employment rate for all youth by 5%, and black youth by about 10%.

Another way to evaluate this program is to examine its effect upon students sorted by academic ability and socio-economic status of parents. This useful analysis which examines the stratifying effect of educational policies will be deferred until a manpower policy change is presented. Then, comparison by ability and socio-economic status of the parent can be used as a way of demonstrating the comparative effect of an experimental education and manpower program.

Clearly, persons would have to be "cockeyed optimists" to seriously propose An Educational Policy for America. To begin with, they would have to augment high school faculty that educate about 37% of all high school students in America with vocational-technical teachers. The next challenge would be to create a secondary school program of sufficient interest to students so that 15% of 10th graders (30% for blacks) would not drop out of high school. Reorganizing community colleges to become one year postsecondary technical institutions would be a task certain to occupy the attention of the educational policy community for a year or two. Any slack time developing new curricula for community colleges in America could be spent by policy persons on finding employment for about one-half of the basic adult education teachers in the United States. They won't be needed any longer.

It is probably true that the institutions potentially disrupted by

An Educational Policy simulation would be enough to wreck any chances of its success. The negative relationship between the number of people inconvenienced by a policy change, no matter how desirable the outcome, and the chances of that policy ever becoming instituted is implied by this policy simulation. This example simulation not only describes the consequences of a social policy too complex for the human mind to calculate, but a crisp view of the expected backwhip from the displacement effect of change.

Although beyond the scope of the example, it is certain that if persons were ever courageous enough to pursue any aspects of this gigantic policy, they would want to examine component parts of the conglomerate simulation, for example, simply transferring all students to vocational-technical programs. TWS is really designed to facilitate such experimentation, in a way that outcomes from complex but explicit alternatives can be estimated in advance of program implementation. This "laboratory for designing the future" is the essence of TWS.

Finally, policy persons would want to know if the future labor demand by occupational cluster was approximately consistent with the occupations offered in secondary and postsecondary vocational education programs. This is based on the popular assumption that public education should fit labor supply to projected demand. The societal fuss should erupt over who gets shuffled into which vocational education programs and who gets to attend college.

If a reduction in the unskilled proportion of the labor force by 4% is reasonable, and doubling the proportionate reduction of black males in unskilled occupations is everywhere accepted, then An Educational Policy would have a popular base of support. Answers to these questions are beyond TWS. TWS raises the questions in an explicit way. The answers must

come from personpower demand forecasters and the political hearts of men and women everywhere.

A Manpower Policy

Manpower programs are essentially an extension of educational programs, but typically are aimed at groups of persons for whom education has failed and find themselves out of the labor force, "looking in." The purposes of manpower programs are:

1) To fit the unskilled for better jobs;

2) To augment the supply of scarce skills;

3) To improve the efficiency of the labor market.

Public service employment has become an important part of manpower programs. Most of these programs have no training components and are often disguised as work experience or on-the-job training programs.

Manpower programs are administered by the Department of Labor. In December of 1973, the Comprehensive Employment and Training Act (CETA) was signed into law. CETA was to offer coordinated administration to what previously were a set of separately administered programs, so-called categorical aid programs, for example: the Job Corps, the Neighborhood Youth Program, Operation Mainstream, the Concentrated Employment Program and the Manpower Development and Training Act. A second feature of CETA was to vest much decision-making power at the local level, the so-called prime sponsor. It appears that one decision made by prime sponsors was to not pass very much useful data describing program impact on to Washington, so that it is practically impossible to learn about the impact of CETA programs in very much detail.

The goal of CETA is:

"Statement of Purpose

Sec. 2. It is the purpose of this Act to provide job training and employment opportunities for economically disadvantaged, unemployed and underemployed persons, and to assure that the employment and other services lead to maximum employment opportunities and enhance self-sufficiency by establishing a flexible and decentralized system of federal, state and local programs. (P.L. 93-203, 93rd Congress.)"

Title VI (created by the Emergency Jobs and Unemployment Assistance Act of 1974) of CETA was a tack-on to provide temporary public service employment to help the unemployed during 1974-75. The Youth Employment and Demonstration Projects Act of 1977 is designed to attack structural unemployment programs for youth. The programs in this Act are not included in TWS(1), they are programmed into TWS(2), but, of course, there are no data for parameterizing, as of now.

To estimate the impact of CETA against its stated objective, TWS sub-contracted with a small research firm to gather together a report about the outcomes of CETA. The major finding of the report is that the Department of Labor really does not have much information (January, 1977) about CETA impact, described in terms of "what happened to clients after CETA." A study entitled, The Continuous Longitudinal Manpower Survey, being conducted by Westat, Inc., is, apparently, gathering these data, but, sadly, lump over one half the programs into something called "employability development."

In view of all this, the TWS staff examined data from the Employment and Training Report of the President, 1976, and from these data estimated the percentage of the population in CETA, the placement rate and program cost. Based on these sketchy data, TWS assumes about a 35% placement in unsubsidized (by CETA) employment from all programs but Job Corps and Direct Placement. For Job Corps, the placement rate was estimated at about 70%, while Direct Placement was set at between 80% and 90%.

The TWS status simulation includes a reasonable estimate of the scope, cost and impact of CETA programs on the simulated cohort. The so-called Summer CETA program is included in TWS. It is a summer jobs program for inner-city youth, described by the Department of Labor as their "fire-fighting program." No information was available on the impact of this program.

TWS was used to test the results of a manpower program which was unique from those currently available to CETA clients. Loosely based on the Work Experience and Training Program under the Economic Opportunity Act of 1964 and certain aspects of Job Corps, this experimental program is called the Classroom Skill Training and Cooperative Work Experience Program (CSTCWEP).

The experimental policy run targets CETA services on high school dropouts, black, inner-city youth, idle males and separated women with children. The program has several essential features:

1) To provide clients with job skills they do not have through education. Job skills would be provided in occupations for which there was a projected demand and in which the client demonstrated a potential to succeed;
2) To use the work experience component of the program as a transition experience from the classroom to work, not as a temporary, subsidized job with a doubtful future;
3) To use the facilities of existing secondary and postsecondary vocational-technical schools, community colleges and 4-year colleges wherever possible, and provide earned educational credentials to clients whenever possible;
4) To use residential centers for inner-city youth as an environment more likely to support the severe behavioral change required to "turn around" the lifestyle of disadvantaged youngsters;

5) To support day care centers for children of separated women;

6) To provide for an active placement service.

CSTCWEP assumes that the economy is producing labor demand in sufficient abundance to provide jobs for CETA completors. The problem is that some labor supply is not qualified for the jobs available and because they have experienced failure in the work world, have diminished confidence in their ability to succeed. They also lack educational credentials. Obviously, such a program would be questionable in a long-term, tight labor market, and could be inconsistent with both human stock and labor market realities. This is discussed in more detail in the Observations section. CSTCWEP was tested in an average labor market against status conditions, which includes a representation of CETA as it is now organized. All existing CETA programs were closed for the policy test. Persons who selected CETA could only select CSTCWEP. (The Summer CETA Program for Youth was not closed in this experiment).

The gross or total cost of CSTCWEP is about $2500 more per person than the regular CETA program, i.e., stipend = $4780, program cost = $3000, gross cost = $7780 (all CETA Programs are annualized in TWS). The comparative net cost of CSTCWEP is also high, because program participants are focusing themselves more on learning than producing (net CETA cost subtracts an estimation of the value of productivity while in CETA from gross cost). Gross CETA cost is included in total social cost, not net CETA cost. CSTCWEP assumed a placement rate of 80%. This goal is based upon Job Corps experience and the history of the Work Experience and Training Program (Bateman, Worth, 1967).

Clearly, more manpower program experience must be examined in

organizing CSTCWEP. TWS allows testing what the effect of a manpower program with explicit characteristics (clients, cost and placement rate) would be under defined conditions. The findings described below are a result of experimentation under the stated conditions described in this publication. Parameters can be easily changed in TWS, until a program that appears do-able and desirable emerges.

Table 13 describes many of the important differences between status conditions and CSTCWEP. For all persons, wages and salaries increase more rapidly than social costs by a substantial margin. Average, annual per capita gross earnings increase by $50 more than salaries and wages, which result from CETA stipend payments during training. This represents a fairly significant redistribution of purchasing power to CETA clients or government transfers.

TABLE 13

Status Compared to CSTCWEP

Group: All

		Policy Name Status	Policy Name CSTCWEP	Difference
PER CAPITA	Gross Earnings	$5215.	$5469.	+$254.
	Salaries-Wages	$4802.	$5006.	+$204.
	Social Costs	$1456.	$1594.	+$138.
	Welfare (AFDC) Costs	$ 233.	$ 163.	-$ 70.
	Gross CETA Costs	$ 70.	$ 284.	+$214.
PERCENT OF POPULATION	Full-time Employment	56.26%	59.30%	+ 3.04%
	Part-time Employment	7.5 %	6.77%	No Change
	Welfare	6.0 %	4.42%	- 1.58%
	Idle	20.9 %	17.79%	- 3.11%
	CETA	1.6 %	3.5 %	+ 1.90%
	Unemployment Rate	8.3%	6.6 %	- 1.7 %

The increase in social costs is a function of increased CETA costs, as welfare (AFDC) expenditures are dramatically reduced. Two problems probably understate the effect of this policy, and they should be stated here before further analysis is offered. First, a longer simulation would demonstrate so-called benefit effects more favorably, as CETA clients who are successfully placed should behave more like the labor force in general. Secondly, the current version of TWS does not allow simulated persons to jump occupational clusters, once a cluster is selected. Cluster selection is almost entirely based upon education. Although this is not unreasonable, CSTCWEP should function as an educational program to provide persons with skills and credentials to move among occupational clusters. The increase in wages and salaries is probably somewhat understated as a result of these factors. TWS(2) does allow simulees to jump occupational clusters.

For all persons, full-time employment is up by 3%, idle is down by 3%, and the unemployment rate is down from 8.3% to 6.6%. For people in general, CSTCWEP is better than a break-even program. Put another way, Table 13 suggests that <u>if</u> a CETA program like CSTCWEP were maintained under average labor market conditions, there would be less unemployment, fewer people idle and a sharp reduction in welfare benefits. This simulation also implies that the benefits would clearly exceed costs for all people, if such a program were "set in place".

CSTCWEP is an example of an important use for TWS. A simulation clearly states conditions required to attain specified goals for named subsets of the population. The logic of TWS can be examined (and surely improved), and data from operational and/or experimental programs can be used for continued parameterization, until there is widespread confidence that an operational program can meet these conditions. Without TWS it would seem impossible

to specify or calculate a developmental process for human capital formulation (to use slightly dehumanizing economists' slang) in a way that reflects real world complexity. This is not the same thing as describing all the operational details of a program that would accomplish this goal. The simulation suggests limits and related outcomes for such programs under specified conditions. These determinations are established before a program is initiated. Program managers must develop strategies to meet conditions suggested by a simulation. Paramaterizing policy runs with data from experimental programs is a way to determine feasibility. Data from operational programs can be used in reparameterizing TWS, as a way of monitoring a new social program when it becomes operational.

CSTCWEP was targeted to certain subpopulations, so let us now examine its effect on blacks and women. Table 14 describes the outcomes for black males and females. For black males, the average, annual per capita increase in social costs is about equal to the increase in gross CETA costs. The increase in wages and salaries exceeds the increase in social costs per black male, while average, annual per capita gross earnings are up about $175 over increases in salaries and wages. This represents a transfer in purchasing power through the CETA stipend. Black males out of the labor market decrease by 5%, the unemployment drops from 9% to 6.5% and full-time employment increases by 5%. For black males, CSTCWEP appears to be a positive program.

TABLE 14

Status Compared to CSTCWEP

		Group: Black Males			Group: Black Females		
		Policy Name Status	Policy Name CSTCWEP	Difference	Policy Name Status	Policy Name CSTCWEP	Difference
PER CAPITA	Gross Earnings	$5799.	$6347.	+$548.	$3941.	$4470.	+$529.
	Salaries-Wages	$5548.	$5919.	+$371.	$2949.	$3506.	+$557.
	Social Costs	$1176.	$1484.	+$307.	$1966.	$2118.	+$152.
	Gross CETA Costs	$ 132.	$ 451.	+$319.	$ 167.	$ 621.	+$454.
	Welfare (AFDC) Costs	$ 36.	$ 22.	-$ 14.	$ 734.	$ 449.	-$285.
PERCENT OF POPULATION	Full-time Employment	68.86%	73.88%	+ 5.02%	39.28%	47.54%	+ 8.26%
	Unemployed	7.54%	5.56%	- 1.98%	8.51%	6.31%	- 2.20%
	Welfare	1.43%	1.02%	No Change	19.56%	12.93%	- 6.63%
	Idle	8.36%	3.30%	- 5.06%	36.35%	27.15%	- 9.20%
	CETA	2.70%	4.92%	+ 2.22%	3.8 %	7.56%	+ 3.76%
	Unemployment Rate	9.10%	6.48%	- 2.62%	15.16%	10.21%	- 4.97%

For black females the results are stunning. Salaries and wages increase dramatically, almost 20%, while social costs only increase by about 7%. Obviously, this results from the enormous decrease in AFDC. Although purchasing power increases for black women through salaries and wages, gross earnings increase less than salaries and wages. Even though this difference might be due to sampling error, the outcome suggests a direction that should be roundly applauded by citizens everywhere. Full-time employment soars by 8%, idle and welfare recipients are reduced by over 15% and the unemployment rate is decreased by 5%. For black women, CSTCWEP seems to be an unqualified success.

Table 15 presents aggregate statistics for the entire cohort, over 15 years, weighted to population values. The ratio of social costs to wages and salaries remains about the same under status and CSTCWEP conditions, while the gain of wages and salaries over social costs is about 4 billion dollars. Since the gross earnings difference exceeds the salaries and wages difference by 3 billion dollars, one can estimate that a fallout

of this policy would be about a 3 billion dollar redistribution in purchasing power through the CETA stipend over 15 years. This equalization would be occurring while significant numbers of persons were being moved into the labor force and salaries and wages were increasing.

TABLE 15

Status Compared to CSTCWEP

Group: All

	Status	CSTCWEP	Difference
Gross Earnings	$312,905	$328,149	+$15,244
Salaries-Wages	$288,144	$300,396	+$12,252
Social Costs	$ 87,412	$ 95,646	+$ 8,234
AFDC Costs	$ 14,015	$ 9,820	-$ 4,194
Gross CETA Costs	$ 4,248	$ 17,040	+$12,792
Unemployed Costs	$ 7,073	$ 6,731	-$ 342
Social Costs to Salaries and Wages Ratio	30%	32%	In Millions of Dollars

CSTCWEP should be a dramatically effective program. Its execution would require continuous monitoring of the labor market demand, consistency of effort over nationally elected administrations, a sizeable "venture" investment in human capital and a cooperation in planning and program administration between educators and Department of Labor persons. Probably, "cockeyed optimism" is an important ingredient in initiating such a social program. This simulation, not unlike An Educational Policy, points up the crucial role of consistent and enlightened management over a long period of time as central to social reform through changes in education and manpower

programs. Justified or not, there seems to be a natural fear on the part of the people to provide government with the power to overtly design and manage the future. These fears cast long shadows on the value of such simulations as provided by TWS.

A Comparison of An Educational Policy and CSTCWEP

Each of the major policy changes presented has focused on a separate social institution. More advanced use of TWS would experiment with education and manpower programs together. Such experimentation is beyond the scope of this initial effort. A comparison of the separate policies explored should be instructive and is possible, as each policy can be compared to status conditions in TWS. In An Educational Policy, only educational experiences of students were changed, all post education experiences were not changed. The CSTCWEP policy held constant the educational experiences of students, but changed certain post education experiences.

TABLE 16

Differences Between CSTCWEP, An Educational Policy and TWS Status Conditions

		An Educational Policy	CSTCWEP
PER CAPITA	Gross Earnings	+$174.	+$254.
	Salaries and Wages	+$167.	+$204.
	Social Costs	+$ 42.	+$137.
	Welfare (AFDC) Costs	+$ 11.	-$ 70.
PERCENT OF POPULATION	Full-time Employment	+ 1.77%	3.04%
	Welfare	No Change	- 1.58%
	Idle	No Change	- 3.11%
	Unemployment Rate	No Change	- 1.7 %

Table 16 describes selected differences between each experimental program and status conditions. For all persons, salaries and wages increase by about four to one over social costs with An Educational Policy, while they only increase at about a two to one rate with CSTCWEP. The comparative increase in social costs on a per capita basis is more than three times as large for CSTCWEP than for An Educational Policy. The per capita increase in salaries and wages, gross earnings and social costs are significantly greater in CSTCWEP. The increase in per capita gross earnings and salaries and wages for An Educational Policy is about the same, while for CSTCWEP gross earnings exceed salaries and wages by about $50.00.

Table 16 also displays differences in AFDC payments between programs and comparative percentage distributions of population differences for full-time employment, welfare, idle and the unemployment rate.

As an aside, this comparison makes clear to the author that in the absence of TWS (or something comparable), his human mind simply could not organize or calculate either of these policies. Thinking about them together reinforces the value of having a computerized simulator as a planning tool.

Over a 15 year period, CSTCWEP increases salaries and wages by about two billion dollars more than An Educational Policy, but the social cost is over five and a half billion dollars greater. This is displayed in Table 17.

TABLE 17

Differences Between CSTCWEP, An Educational Policy and Status TWS Conditions
1 Cohort - 15 Years

	CSTCWEP	An Educational Policy
Salaries and Wages	+$12,252,000,000	+$10,032,000,000
Social Costs	+$ 8,234,000,000	+$ 2,496,000,000

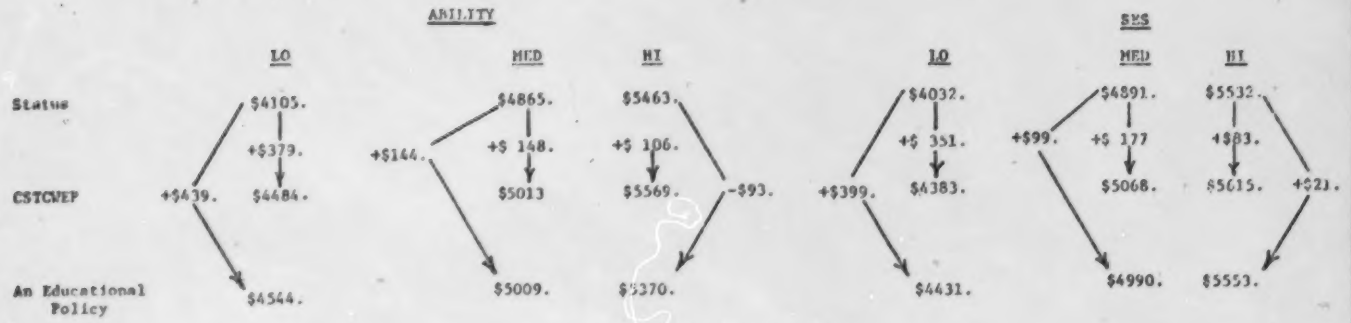
A unique comparison between these social policies is to examine their effect on persons of low, medium and high ability and low, medium and high socio-economic status of parents (SES). Such a comparison examines the equalization power of each policy, at least in terms of these characteristics.

Table 18 attempts to present this comparison. It displays the average, per capita salary and wage or social cost for persons of low, medium or high ability and SES. The numbers within the arrowed lines are the differences between the status policy and each social policy simulated.

TABLE 18

Differences Between CSTCWEP and An Educational Policy Program in Terms of Per Capita Salary and Social Cost by Low, Medium and High Ability and Socio-Economic Status (SES)

Per Capita Salaries and Wages



Per Capita Social Costs

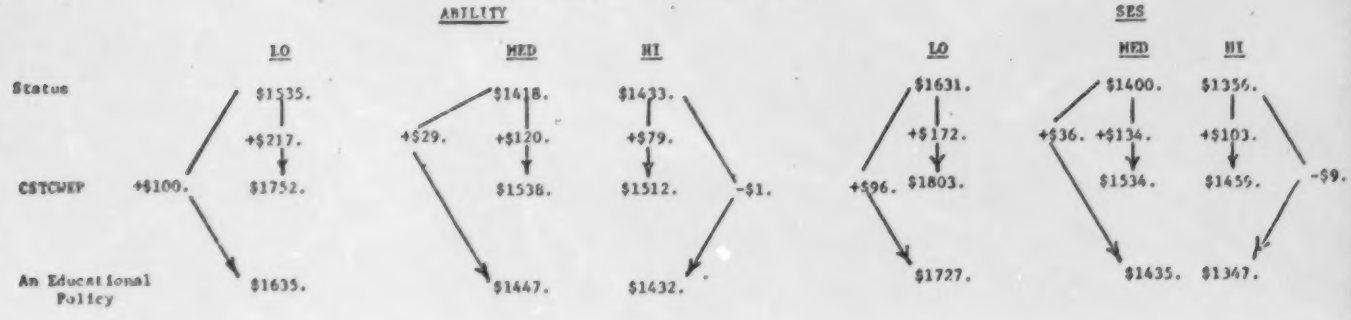


Table 18 seems to make three obvious statements:

1) In all policy conditions, low SES and ability persons consume more social costs than high SES and ability persons;
2) High ability and SES persons earn more salaries and wages than low ability and SES persons;
3) Salaries and wages for low and medium ability and SES persons rise faster than social costs under both policies.

The crucial policy question is to estimate the effect of each social policy on differences between social costs and wages and salaries for ability and SES groupings against status conditions. The numbers between the arrowed lines provide a suggested answer to this question.

Essentially, Table 18 is presenting average, annual, per capita social cost and salaries and wages differences between high, medium and low ability and SES persons for the status and policy conditions. These comparisons show the relative status of low, medium and high ability and SES persons under various policy conditions. Such analysis allows an understanding of important characteristics of the objects of social policy. For example, that both policies tend to close the income gap between low and high SES persons would seem to support the equalization aspirations of the American value structure. Neither policy eliminates salary and wage differences between ability and SES groups, they tend to make them less severe. Low ability and SES persons gain more in wages and salaries in the experimental programs than do high ability and SES people.

Table 18 clearly states that low ability and SES persons are more expensive to maintain than medium and high ability and SES persons. It is

clear that An Educational Policy is less costly than CSTCWEP. Very little additional social cost is expended on high and medium ability persons under An Educational Policy. Increased social costs for all ability groupings are greater under CSTCWEP. This reflects the fact that public education is less costly than personpower programs for adults, where stipends are necessary. The family structure no longer supports CETA clients. The same trends carry over to SES groupings.

Although it is clear that any advanced, technological society with a changing economy will always require both education and personpower programs, it also seems that to the extent public education can equip students with the skills and credentials necessary to enter and stick in the labor force, a corresponding savings occurs with social costs for manpower programs.

All High School Dropouts

In the real world, it would be absurd to think about an educational policy which forced all high school students in a grade cohort to become dropouts to test some effects of education. At first, it sounded like a ridiculous TWS exercise. Upon reflection, we decided that such an experiment could provide insights about the consequences of education (in terms of TWS output tables) which could never be otherwise imagined. We concluded that policies that tended to move in the direction of decreasing high school dropouts, might be more enlightened about the career consequences to students by such a policy experiment.

Our intention is to compare the history of an entire grade cohort of students we force to become high school dropouts. We did not discriminate on differential dropout rates by race, sex or ability. We impartially "pink slipped" the entire grade cohort, let them play out the first 15 years of their post-high school life, and compared the results with status conditions.

This policy (as on all TWS policies) is very much like observing a single grade cohort compete against a world of status cohorts. This point is quite important to keep in mind in examining the results of any experiment.

Table 19 shows the per capita, average, annual results of the All High School Dropout Policy compared to the status run, under average labor market conditions (8.3% unemployment).

TABLE 19

Status Compared to All Dropout Policy
Group: All

	Status	All Dropout Policy	Difference
Gross Earnings	$5215.	$4462.	-$753.
Salaries-Wages	$4802.	$3983.	-$819.
Social Costs	$1456.	$1219.	-$237.
Welfare (AFDC) Costs	$ 233.	$ 280.	+$ 47.
Gross CETA Costs	$ 70.	$ 91.	+$ 21.
Unemployment Costs	$ 117.	$ 141.	+$ 24.

On a per capita basis, the dropout cohort earns about $819 less than the status cohort. The difference between gross earnings and salaries and wages suggests that if all other conditions remained constant for the dropout cohort, they would benefit from government transfers. We did not plan for additional benefits beyond those in the status simulation for the dropout cohort, nor did we increase the size of the CETA program. Welfare, CETA and unemployment costs explain this difference.

In spite of the increased government transfers through welfare, CETA and unemployment, social costs are down a resounding $237 per cohort citizen. These are savings which result from education. Almost no one goes to college under the All High School Dropout Policy, and everybody drops

out of high school. This turns out to be a sizeable savings, when you consider education is a one-time investment in TWS, with the exception of adult education. For all cohort persons, Adult Education increases by over 8% in an All High School Dropout Policy.

TABLE 20

Status Compared to All High School Dropouts Policy
1 Cohort Over 15 Years
Group: All

	Status	All Dropouts	Difference
Gross Earnings	$312,905	$267,748	-$45,157
Salaries-Wages	$288,144	$238,991	-$49,233
Social Costs	$ 87,412	$ 73,142	-$14,270
Social Cost to Salaries and Wages Ratio	30%	30%	In Millions of Dollars

Table 20 describes the economics of such an unthinkable policy in more aggregate dimensions. Salaries and wages are down more than gross earnings for our dropout cohort, due to government transfers. The savings in social costs due to education is in excess of 14 billion dollars, because the difference in social costs includes the increased income transfer programs. This all seems to make sense, or about what we might have expected. The test to the reader's imagination is--why the differences? The obvious answer is provided by Table 21.

Table 21 shows the distribution of the status and experimental cohorts over occupational clusters, broken down by sex and race. Naturally, what has occurred is that we have created a pool or queue of unskilled labor, at the expense of every other occupational cluster. For white males, we have increased the percentage of unskilled workers by 35.81%, but for black males

we have only increased the percentage of unskilled workers by 21.48%. Within our experimental cohort, the difference between unskilled black and white males is only about 1%, while under status conditions it is about 13%. The same trend applies to women. Since we did not do anything about the racial bias in the labor market section of TWS, these differences are due to educational attainment. This does seem like a peculiar way to achieve equality of occupational opportunity. Although whites increase in agricultural occupations at a faster clip than blacks, white males maintain an advantage in technical and skilled occupations under the All High School Dropout Policy.

TABLE 21

Status Compared to All High School Dropout Policy
Differences Between Blacks and Whites
on
Occupational Cluster Distribution

	Status				All Dropouts			
	Black Male	White Male	Black Female	White Female	Black Male	White Male	Black Female	White Female
Prof	.13%	1.55%	.22%	1.17%	0.00%	0.00%	0.00%	0.00%
Mgt	2.7 %	7.39%	1.84%	4.07%	0.00%	.23%	0.00%	.01%
Eng	.12%	1.24%	.17%	.33%	0.00%	.15%	0.00%	0.00%
Tech	7.75%	13.19%	4.21%	4.29%	2.35%	3.27%	2.46%	1.74%
Office	5.60%	6.48%	11.35%	13.62%	5.52%	5.17%	5.02%	7.79%
Agric	4.24%	2.19%	1.88%	.73%	6.17%	6.99%	3.97%	4.53%
Skilled	16.18%	21.80%	5.66%	7.43%	3.79%	6.78%	2.01%	1.50%
Unskilled	31.52%	18.81%	13.61%	7.71%	53.00%	54.62%	26.07%	28.41%

Table 22 points out another equalizing outcome of the policy.

TABLE 22

Status Compared to All High School Dropout Policy
Per Capita Salaries and Wages
Group: All

	Status	All Dropouts	Educational Policy	CSTCWEP
All Whites	$4908.	$4503.	$5020.	$5072.
All Blacks	4288.	3634.	4696.	4749
	-$ 620.	-$ 419.	-$ 324.	-$ 323.

Both An Educational Policy and CSTCWEP are more equalizing in terms of salaries and wages between blacks and whites than status conditions and increase the relative position of all. However, the All High School Dropout Policy is more equalizing in terms of annual, average, per capita salaries and wages between blacks and whites than status conditions, even though salaries and wages are depressed for both groups. Table 22 compares the occupational cluster distribution with the TWS status run, An Educational Policy and All High School Dropout Policy.

TABLE 23

Differences Among Occupational Clusters for
Two TWS Experimental Conditions Compared to TWS Status
Group: All

	Status	Educational Policy	All Dropouts
Professional	1.21%	1.25%	.0 %
Management	5.19%	3.45%	.13%
Engineering & Science	.71%	.51%	.06%
Technical	8.6 %	11.6 %	2.5 %
Trades	.4 %	.4 %	.04%
Office	7.9 %	12.4 %	6.5 %
Agriculture	1.5 %	1.2 %	5.4 %
Skilled	14.00%	16.3 %	4.0 %
Unskilled	14.7 %	10.8 %	41.00%

Although it is true that TWS(1) understates labor elasticity and correspondingly overstates credentialism, it should help policy persons understand some educational consequences to grade cohorts in the real world. Table 23 does make a point, and that is how education sorts persons into occupational queues. An Educational Policy increases skilled and technical labor supply, at the cost of unskilled workers, compared to status conditions. It reduces the middle management occupational cluster a bit, but increases office workers. The All Dropout Policy increases unskilled workers at the cost of everything.

What are educational planners to do? If in state x, the manpower forceasters predict a labor demand of 41% unskilled workers, are they to adopt an All Dropout Policy? Surely, they should not ignore the relationships among "creation" variables, school experience and becoming credentialized for occupational clusters. Perhaps, rather than allowing the schools to sort on the dimensions described by TWS under status conditions, it might be best from an equality of occupations perspective, to occasionally produce an All Dropout grade cohort, say once every 6 years. This could meet the unskilled personpower needs of the nation and simultaneously achieve equality of lifestyle goals among races, the privileged and the poor and the academically gifted and intellectually deprived.

Such a paragraph is obvious nonsense, but it does serve to reinforce a point which TWS seems to be making. The schools are a part of a human sorting process in the United States. We can leave them as they are, and attempt to equalize opportunity through manpower programs. We can use education alone to help overcome labor market barriers or plan coordinated manpower and education programs targeted at orchestrated social criteria.

We can attempt to intervene through other mechanisms, say affirmative action, but one could wonder about the long term bite of such programs, given the need for skilled personpower by an advanced, technological society. We can do nothing, which means to purposefully enforce policies which maintain status conditions. TWS is designed to help policy persons decide what could happen under specified education and manpower conditions, not to dictate policy. Clearly, it forces more openness about the influence of powerful social institutions on the distribution of resources among people. That should be enough to guarantee the success of TWS in the United States and every free and democratic nation in the world.

OBSERVATIONS

As a developer of TWS who has conducted many example policy experiments, it seems reasonable for me to conclude this publication with several personal observations about the potential value of TWS if it were to be used by the policy community. I shall present several reasons for implementing TWS and follow these arguments with new understandings I have gained through TWS about transition to work issues.

The most striking advantage of TWS seems to be its ability to make understandable the structural architecture of the development of persons into workers. To the extent that structure is the problem, a symptomatic and fragmented policy strategy is necessarily insufficient. The transition to work structure is simply too complex to be understood with even a remote notion of the web of connecting links in the absence of

a model like TWS. Without knowledge of the structure, it is difficult to understand or predict the consequences of education or manpower policy alternatives.

A second reason for implementing TWS is that it rivets attention upon the individual as a multi-dimensioned person in the formulation of education and manpower policy. TWS should help economic planners understand the human consequences of production alternatives and provide education and personpower planners with better understandings of labor force dynamics. Typically, the human condition is represented by several sets of single numbers at best, when economic and education policy alternatives are under consideration. Although TWS policy experiments not reported in this article have demonstrated that economic growth and an associated demand for labor is essential to an individual's opportunity to find a meaningful job, knowledge about the causal paths that determine the distribution of jobs for citizens under different levels of unemployment rates should be made explicit for various policy proposals. TWS allows these estimates to be made before policy is set in place. Policy which is influenced by such advice ought to be more responsive to the human condition.

A third reason to implement TWS is to facilitate coordinated planning among those persons who administer education and manpower programs. TWS forces an explicit dialogue about assumptions and expectations and provides a structure that can be parameterized by individual data sets which describe the unique contributions of education and manpower programs. Now that Congress has mandated more coordination between education and manpower programs, this would seem to be an impelling and timely reason for seriously considering the implementation of TWS. TWS can also be used to

to monitor comprehensive education and manpower programs, thus providing a basis for a continuous dialogue between education and manpower program managers and a single structure to describe their coordinated impact.

A fourth reason for implementing TWS is that it should make education and manpower programs a more integral part of economic and social planning. It accomplishes this by allowing education and manpower programs to be considered together and for their joint effect, under various policy conditions, to be examined against labor market criteria. Clearly, there are tradeoffs that must be made between investments in human and capital stock. TWS provides the policy community with insights into the human consequences of such decisions, so that a society might make an appropriate investment in human development in a way that encourages sufficient productivity to accommodate the anticipated work force.

A final reason for implementing TWS would be that it helps policy persons to focus upon important subgroups of the population in an explicit way. The example policy experiments offered in this publication demonstrate this advantage of TWS clearly. The manpower policy experiment was focused on central city blacks, high school dropouts and separated women who were out of the labor force. It had dramatic effects for the entire population. Black males benefited enormously by a policy which encouraged them all to become high school completors and transferred them to vocational-technical programs from general academic programs. This discussion suggests the fundamental contribution of TWS to policy formulation. Under various and explicit manpower demand conditions, policy persons can experiment with various education and manpower programs for defined subsets of the population until a clear consensus is reached about the goals of a

policy. TWS can be parameterized with information from several data sets at the same time. Some of the data sets may be from experimental programs. Some parameters can be a policy goal. A policy team can know the relative validity of the parameterizing data sets, and with a sufficient number of sensitivity policy runs, become quite confident about "causal pressure points". Programs can then be initiated to accomplish specific goals for the entire population or specific subgroups within the population and TWS can be used to monitor these programs once they are instituted. That TWS can reference econometric models by way of segmented, occupational demand clusters, enhances its usefulness.

TWS provides a perspective for anticipating the impact of a social policy. This could be important in setting expectations or evaluating results of a social intervention. For example, it might be that a particular program is reasonably effective for a small segment of the population. One would not expect such a program to have very much influence on some averaged characteristic for the entire population, e.g., salaries and wages. TWS is sufficiently sensitive to detect such a change if it occurs. Frequently, too much is expected of a social intervention program which, in fact, only touches the lives of a few people. Such inflated expectations are often damaging to social progress.

The privilege of having been able to experiment with TWS has caused the development of understandings or insights which are now shared with the reader as an argument for implementation and further development of TWS. It is my firm conviction that further development should be driven by implementation, even though some technical problems remain in TWS. They will be solved best under the press of implementation reality.

The first set of observations are structural. The most alarming observation I seem to have made is the requirement for an occupational vacancy policy in the United States. By this I mean that there must be a definite specification of the number of vacancies required to meet the needs of all those who require income. Productivity and growth goals must be tempered by the requirement to provide jobs for all persons who must earn an income. Unless the private and public sectors join together in meeting the occupational requirements of the nation in a planned way, economic disaster will be systematically visited upon predicted subsets of the population. The haphazard approach of letting technology, the profit motive and limited resources take us where they will, makes planning for participation in the labor force through education and manpower programs difficult. In view of the values of a capitalistic society, I have concluded that we must accept as a "cost of doing business" an overhead to support jobs for all those who need income. This can be accomplished through public service employment or an occupational vacancy policy for the private sector, e.g., a shorter work week per person.

Not only must there be enough occupational vacancies in the aggregate, but the created vacancies must meet the capabilities of the range of people who need to work. It is tragic to think about large numbers of people who simply cannot succeed in the vacancies being generated by an advanced, technological society, and who must suffer the penalties imposed upon them by the realities of a capitalistic society. Frequent experiments with TWS in which one observes the systematic flow of predictable people into the unemployed and idle segments of the labor market under various unemployment constraints prompted this policy suggestion.

Whether planners are allocating scarce jobs over an inflated human stock or planning within an equilibrium environment, there are difficult questions to be faced about how to distribute occupational opportunities among the people. I prefer to think about these questions on the mythical assumption that there is a stable policy which specifies the occupational mix most likely to stimulate maximum growth and, at the same time, meets the occupational needs of the nation. Given the influence of the multi-national industries, this is, by definition, an achievement that requires international cooperation.

TWS can describe the flow of persons from creation to various segments of the labor market, including occupational clusters, unemployed and idle. The status condition makes it quite clear that to do nothing is to endorse a policy which sorts persons into occupational clusters, the unemployed or idle segments of the labor market on a systematic basis. The status condition also makes it clear that educational attainment plays a critical role in sorting persons into occupational cluster queues and that educational attainment is systematically related to "creation attributes". However, it could be that Thurow's (1974) queue theory which suggests that educational credentials hierarchically organize the work force could be misleading. Perhaps the natural stream of events in an advanced, technological society creates occupational vacancy bottlenecks. This natural momentum of economic growth may be creating vacancies in which a sizeable proportion of the population is incapable of successful performance. In the short run, hardly anyone would disagree that the hard core, middle aged, discouraged worker is unlikely to develop the verbal

skills and social graces necessary to become a Harvard professor by virtue of a six month work experience manpower program. The fundamental question seems to be: Is there a limited supply of personpower crucial to sustaining an advanced, technological society and can they produce sufficient growth to sustain the occupational needs of the nation? There might need to be some productivity limits placed on affirmative action programs in certain occupations or else growth could be seriously threatened, thus undermining the ability of a society to support the disadvantaged and discouraged worker.

TWS appears to be a useful tool to understand what a reasonable policy might be under certain value and empirical assumptions. TWS should be particularly valuable to policy persons who are trying to use education and manpower programs to equalize occupational opportunities or the benefits from work. For example, one might characterize the current policy as a belief that labor supply and demand will move into equilibrium in the medium run, and public service employment programs are sufficient medicine to alleviate discomforts during business cycle swings. Such a policy position does not consider the human condition of subgroups within the population, or the potential effect of education and manpower programs to improve the life condition of population subgroups who suffer the most during economic swings. TWS should help policy persons sort through these complex issues. TWS can help determine the existing structural reality of the labor market and facilitate the formulation of new structures to meet emerging objectives. Perhaps TWS could be useful to explore the human distributional questions associated with Holt's (1970) interesting suggestion that manpower programs can help battle inflation by reducing bottlenecks for occupational clusters

which are undersupplied. Such a policy is predicted to drive prices down, thus not contributing to a tight money policy which increases employment.

The magnitude of cost differences between education and manpower programs with TWS experiments was impressive. Given an occupational vacancy policy which can accommodate the work force, a massive shift of resources to education which prepares students with entry skills for work seems appropriate. My own research (Conroy, 1976) suggests that it is not important that students enter the precise field for which they have learned occupational skills. What appears to account for the success of occupational education students is that they have had a successful experience in learning how to function in an occupation. It seems as if this provides a basis for transfer.

It is absurd to hold the education community responsible for swings in the labor market, either in terms of aggregate demand or demand by occupational cluster or segment. Since long trend projections of labor demand are suspect but since occupational education graduates do better than general education graduates anyway, educational planners ought to avoid over-reacting to demand projections or criteria which tie program success to the number of completors placed in the field for which trained. This would be true even if the United States thought seriously about an occupational vacancy policy. It is all too easy to let efficiency concerns confuse human growth and occupational freedom needs.

TWS seems the perfect tool through which to sort out and monitor the flow of persons from creation to work. If the existing social structure is systematically dealing a lousy hand of marked cards to the same players in terms of probabilities of achieving occupational equality, then TWS

ought to be helpful in determining the "marks" and suggest ways to reshuffle the cards to attain outcomes which might be more consistent with societal values.

Manpower programs have a potential to become a vital part of a comprehensive social program which attempts to equalize occupational opportunities. Although TWS makes clear that manpower programs are more costly than education programs because of associated government transfers in the form of stipends, they certainly offer an opportunity for persons to re-enter the labor market or improve their position in the job queue.(5) TWS(1) seems to state that manpower programs are particularly appropriate for selected target groups, and that the effect of manpower programs can be dramatic, given enough jobs to go around.

Building and experimenting with TWS has led me to the conclusion that manpower programs can break the iron grip educational attainment credentials have for entry to occupational clusters. To achieve the success described in the TWS manpower policy experiment presented earlier requires more imaginative manpower programs than those currently operational, with clear linkages to adult education programs and other educational establishments. To focus funding on the prime sponsor seems a clever way to jar the educational community to be responsive to human and economic realities. There is no reason why educational credentials ought not to be a part of manpower programs. Unfortunately, it is silly to expect manpower programs to accomplish miracles, in the absence of an occupational vacancy policy. Given bottlenecks for some occupations and long queues for others, they can be stunningly effective in adjusting labor supply to demand. TWS can be invaluable in describing the expected outcomes of manpower program alternatives and monitoring program results.

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(5) TWS(2) will allow for testing movement among occupations with manpower programs.

It is perfectly clear to me now that education and manpower programs must be comprehensively planned. Although each program is unique, together they provide the vehicles for occupational growth. It doesn't take many experiments with TWS to figure out the advantage to persons and the economy of dynamic manpower programs. Since one must expect a fluid labor market, school dropouts and persons who decide to accept the challenge and adventure of a new career, manpower programs are essential, both to the individual and the economy. If educational planners could anticipate manpower programs which were responsive to short term swings in labor demand, they could organize their programs with much more confidence. If the United States developed an occupational vacancy program which fulfilled the requirements of the work force, the combination of education and manpower programs would undoubtedly provide a mechanism through which individuals could achieve occupational fulfillment. To the extent that occupational vacancies are unpredictable and inconsistent with the needs of workers, education and manpower programs will fall short of equalizing occupational opportunities. Finally, it is important to anticipate the likely consequences, if any, of an occupational vacancy policy on the incentive system assumed to be prerequisite to productivity in a capitalistic society.

The nationalization of occupational vacancies as a prerequisite to sound education and manpower planning does seem like a severe suggestion. It is fairly certain that the citizens of the United States would not now support such a policy, nor would major industries be enthusiastic with occupational quotas per unit of production.

In a society which literally ostracizes the non-productive, such an intervention might be a more reasonable alternative than the current,

profit-motivated application of technology. The essential problem is that planning for education and manpower programs requires anticipating occupational demand, both in the aggregate and by occupational cluster. Occupational demand is beyond the public's control. The critical question is: Does government have the right to plan the number of occupational vacancies to be maintained in the production of goods and services? If not, what are the alternatives under various occupational vacancy assumptions and what are the consequences to educational and manpower planners?

Skinner (1971) and Galbraith (1973), in two books which should be read side by side, make clear that there are forces which manipulate human choice. TWS is not a device to thwart the private sector's right to manipulate. It is supposed to be a tool to help the people's government understand the human consequences of various social policies. I do not think the widespread use of TWS should be considered as a threat to the private sector. It should shed light on the consequences and causes of status labor market conditions and allow for policy experimentation.

There is a widely held belief in the United States that all men are created equal and that differences in occupational status, educational attainment and income are a function of perseverance. Although some people in the academic community and government are better informed because of the work of Blau and Duncan (1967) and others, TWS could be an important tool to instruct the public about the systematic complexities of the transition of persons to workers. In a democratic society, this should be a welcomed tool for the self-guiding function of citizens everywhere.

The argument that TWS or similar planning tools will lead to a centralized, cybernetic-orientated government does not appear to wash. The

central problem in the United States seems to be that the states and local communities are not staffed to use advanced planning tools, while the central government is. This does not mean that the central government should divest itself of its competency. That would be nonsense. It does suggest that local and state governments should upgrade their planning capabilities. TWS is designed to be used at both the national and regional level, since planning requires both a national and regional view.

Although I sincerely hope that states and regions implement TWS, I caution potential users to think through its implications before they set TWS in place. TWS is essentially technology. As Rickover (1966) suggests, "The morality of technology is more important than science, since technology is the apparatus through which knowledge is put to practical use." TWS should be technology which helps us understand the human consequences of a "more technology the better" national philosophy, particularly as it influences man, education and manpower programs and occupations.

Finally, TWS should help planners in the public and private sector adjust policies to the human condition. Economic policy which generates labor demand must, sooner or later, accommodate itself to the human condition. The typical planning tools do not allow for monitoring, in much detail, the human consequences of economic and social policy. To admit to human elasticity in the labor market and the difficulty in estimating the occupational consequences of economic policy is one thing, to plan without trying to understand how people are being bumped about under various policy conditions is another. TWS is an explanatory model, which is supposed to help the policy community understand anticipated directions of outcomes which result from changing experiences for substantial numbers of persons. TWS helps the policy person

isolate the chain of events which leads to a desired outcome. It is not a "black box" model, through which persons do not have to concern themselves with understanding how results are attained. In my view, such models are inappropriate for education and manpower policy. It will be disappointing if someone does not take me up on my challenge to implement TWS as a supportive planning tool for education and manpower programs.

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